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A. W. GREELY,
Chief Signal Officer.

Station ---------- RANC ----------



U. S. SIGNAL OFFICE,

SAN FRANCISCO, CAL.

ANNUAL REPORT

OF THE

CHIEF SIGNAL-OFFICER

TO THE

SECRETARY OF WAR

FOR THE

YEAR 1877.

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1877.

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REPORT

OF THE

CHIEF SIGNAL-OFFICER OF THE ARMY.

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL-OFFICER,
Washington, D. C., November 10, 1877.

SIR: The established course of instruction in military signaling and telegraphy, meteorology, and the Signal-Service duties at stations of observation and report, embracing those of the sea-coast service, of the service in the interior, and those on the telegraphic lines upon the frontier, has been continued at the school of instruction and practice at Fort Whipple, Va. The drills of the Signal Service with arms, in the maneuvering of field-telegraphic trains, the rapid erection of telegraphic-lines, the management of the signal and other apparatus habitually used by the corps in the field, in time of war or for field service, have been regular and thorough. The character of these duties has been so often rehearsed that it is not necessary to refer to them minutely here. The apparatus for the study and practice with instruments for the meteorological duties, the equipment for the drill with arms, for the drill in field-signaling, the drill with field-telegraph trains, the construction drills, and the duties on signal and telegraphic stations, is sufficient.

It is endeavored to keep pace in all improvements with the progress made by scientific ingenuity, and in the modes of rapid communication, now necessary to be used in war.

Experiments in signaling and telegraphy are made at this post, under proper supervision, and such apparatus are tested as may have received the notice of this office, or to which its attention is directed by higher authority.

The duties at the post are conducted under strict military rule. It is controlled as connected with and a part of this office. In the practice work of the last year a form of drill has been established for the rapid erection of towers, as stations, for purposes of observation or signaling in the field, with what are known as portable or aerial ladders.

A series of experiments made with sun-flashes has demonstrated as possible the transmission of word-messages, under favorable circumstances, to a distance of thirty miles.

The course at Fort Whipple is intended to furnish a force of enlisted men—enlisted after examination—disciplined as soldiers and fitted by special instruction for the special duties of the Signal Service.

The officers of the Signal Service pass a course of drill and instruction, and serve regularly at this post before being put upon any other duty. It is recommended that all officers of the Army intended to be instructed as acting signal-officers, or to be temporarily instructors in geographical military departments for the field duties of the Signal Service, be here instructed before being put upon detached duty.

The importance of duties of this character has been fully recognized

by the Navy Department of the United States. The modes of instruction in field-signaling ought to be similar in the Army and Navy, and so complete that any force of either arm should be able at all times to put itself in communication with any force of the other within signal distance.

It is not necessary at this late day to represent at length the propriety that any armed force ought to be able to communicate telegraphically, and by signals, with any other of the same nationality or obeying the same general command.

During the year ending June 30, 1877, First Lieut. R. P. Strong, acting signal-officer, has been continued in charge of the post; First Lieut. J. McClellan, acting signal-officer, assigned to the charge of the instruction department, vice Lieut. C. E. Kilbourne, acting signal-officer, relieved August 12, 1876; Second Lieut. F. S. Rice, acting signal-officer, assigned to duty as acting assistant quartermaster, vice Lieut. C. A. Booth, acting signal-officer, relieved January 17, 1877. Acting Assistant Surgeon L. W. Ritchie has remained in charge of the hospital.

The reduced strength of the Signal Service has rendered it impossible to keep at the post the enlisted force required for all the exercises.

Five commissioned officers have been under instruction during the year, of which number four have completed the full course. (Papers 2 and 3.)

Seventeen enlisted men, having served acceptably at stations of observation and report, have been, according to the regulations of the Signal Service, ordered to the post for instruction, and instructed preparatory to promotion to the grade of sergeants. As candidates, sixteen of this number successfully passed the examinations for the grade of sergeant in the Signal Service, have been promoted, and are assigned to stations. (Paper 4.)

Forty-seven enlisted men have been under instruction for the positions of assistants to observers. Of this number, twenty-nine completed the course of instruction, drill, and practice, passed the necessary examination, and have been ordered to duty at stations as assistants. One was discharged the service at his own request, two were dropped from instruction and discharged the service for misconduct. Three were necessarily ordered on telegraphic duty before they had completed the course, and twelve are still under instruction. (Paper 5.)

No change has been made in the courses of instruction for officers fitting to be acting signal-officers, or in those for candidates to promotion to the grade of sergeant in the Signal Service. (Paper 1.)

Practical instruction in the use of the Morse telegraphic character for telegraphy, upon the wires, has been added to the course of instruction for enlisted men fitting to be assistants to observers.

Under the direction of the Quartermaster-General a set of model quarters for the commissary-sergeant stationed at the post has been erected at Fort Whipple; two new bridges have been constructed on the approaches to the post. The post reservoir has been connected by duet pipes with the Arlington cemetery, which latter station is now supplied with water from the springs and water-works. By direction of the Chief Signal-Officer an addition has been made to the train-sheds which now afford shelter for the different trains at the post. The sewerage of the post has been completed.

A fire-engine is needed for the proper protection of the buildings and the valuable property stored at the post.

The morning report of Fort Whipple for June 30, 1877, exhibits fifty-

one enlisted men present for duty, of whom five were sergeants, forty-five privates, and one hospital-steward. Fourteen of the privates were candidates for promotion, and under special instruction. A personal inspection of the post made by the honorable the Secretary of War since the date of the last annual report gave opportunity to judge of its condition and management.

Under the orders of the Secretary of War the supervision of all the property known as Arlington, except so much as is embraced in the grounds of the Arlington cemetery, has devolved upon the Chief Signal-Officer. There are located upon these lands several families of freedmen, whose labor for a fixed number of days in each year, given in acknowledgment of the privileges they enjoy, has been employed in the work of necessary improvements. The reservation is guarded from the location upon it of idle or useless persons, while the freedmen are protected from intrusion or removal.

In the last annual report the Chief Signal-Officer expressed his conviction that the economy assured to the United States by the duties practiced at this post far exceeds the annual cost of maintaining it. It has made it practicable to put on station duty and in charge of stations those non-commissioned officers and men only who have been drilled, taught, tried, and so known to be fit for the labors and responsibilities to be required of them. The benefits resulting from it as a school of practice, in which men are trained to be at once soldiers and students, have been evidenced throughout the United States. There are no people more proud of the intelligence of their bayonets than those of the United States. It should be felt as an honor that the man is permitted to wear the uniform of the United States Army, and it is hoped a course will be pursued with the Signal Service which will make it so.

The men of this force are engaged on duty as constant in time of peace as in the presence of actual war. The uses of the post at Fort Whipple for the discipline and instruction of the officers and enlisted men of the corps do not cease while either remain in the service. The force, made useful in time of peace by employment through which it is now admitted they return to the United States more than the cost of the service, is kept in readiness for any emergency of armed duty by regular drills, in which the officers and men stationed at this office and those whose changes of station bring them even temporarily within reach of Fort Whipple are there practiced and maneuvered as a part of accustomed duty. Men thus practiced are trained in discipline and look upon events transpiring in their vicinity with soldier-like views.

The advantages of having distributed in the different cities a force of men with such training, habituated to acting in concert by order, and promptly, capable of reporting simultaneously by telegraph and in cipher, as a duty, upon matters of military interest to which their attention may be directed, aside from the routine duties of their station, have been this year sufficiently evidenced in emergencies yet recent. The self-possession of the non-commissioned officers then in charge of stations, their prompt, concise, and reliable reports, rapidly collected from over great extents of territory, for the information of superior authorities, received the warm commendation of high executive officials. The rapid making of reports of this character and the collection of them over the telegraphic wires by ærial signals or by any of the most rapid methods of communication is the especial duty required in the service of the corps in time of war.

It is considered that some of the movements of the troops made possible by this agency were as rapid as any of which there is previous

record. It is difficult to compute in money-value the power of attaining such results.

Meager reports only have been received of the instruction for the field-duties of the Signal Service had elsewhere than at Fort Whipple. No reports have been received from the officer designated as the instructor in military signaling and telegraphy at the United States Military Academy at West Point, N. Y.

In the Department of the Missouri, Lieut. W. J. Volkmar, Fifth Cavalry, A. D. C., has remained on duty connected with the service in that department, and has forwarded regularly monthly reports of the instruction of officers and enlisted men.

The Chief Signal-Officer is confirmed in the view hitherto expressed, that the general instruction of the Army should, to be successfully carried on, be confided to officers first carefully instructed themselves and responsible to the Chief Signal-Officer for the discharge of their duties as instructors.

It is recommended that provision be made that a force of six subaltern officers may be constantly under instruction at Fort Whipple in the duties of field-signaling and telegraphy; it being understood that as each shall have completed the course and passed the necessary examinations he shall join his company and regiment as instructor. The number under tuition at the school of instruction to be kept constant by details to be made from companies and regiments, not before instructed, as vacancies occur.

The act approved March 3, 1875, maintaining the Signal Service, as then organized, and providing for one hundred and fifty sergeants, thirty corporals, and two hundred and seventy privates, was productive of good results. It fixed the duties and gave the formal sanction of law and of official recognition to the forms and usages of the service. It was an approval of the mode in which had been selected, recruited, and disciplined the men provided for and assigned to its various duties at the several signal-posts and stations throughout the territories of the United States. It confirmed the detail of a necessary number of commissioned officers.

It is hoped the reduction of the force, under the act approved July 24, 1876, will be but temporary. Employment can, in the present status of the service, well be furnished to a full force of two hundred and seventy privates and thirty corporals, with one hundred and fifty sergeants, and be of such a nature as to certainly repay more than the money-value of the pay, allowances, and expenditures incident to their maintenance.

The candidates for enlistment in the Signal Service become, as the service progresses year by year, more numerously representative of the better educated classes of citizens. The men to be enlisted are first required to pass a preliminary physical and educational examination before they are accepted for enlistment. After enlistment they are sent to Fort Whipple to be drilled and instructed. They are then tested by practice and further taught by a year of duty and of study in the positions of assistants at stations. They are instructed later in higher branches at the school of instruction at Fort Whipple, and again examined and again tested by practice before being intrusted with the management of stations. They are held to a rigid observance of duty and with careful discipline at their several stations. The plan has furnished a force of soldiers of superior education and good character at the many stations throughout the United States. Their work is in evidence. (Paper 22.)

The work aggregating at this office has become extensive, covering a

field of operations almost coextensive with the Northern Hemisphere, with many and complicated details, each requiring to be carefully elaborated, for each day, with many checks necessary for accuracy, and each limited for its discharge to fixed and very brief periods of time. The steadily improving experience and organization of the service have permitted each branch of duty to be carried on with regularity. The small force on duty has made it necessary at times that part of it should be overworked.

The staff of the office since the date of the last annual report has been constituted as follows: First Lieuts. H. H. C. Dunwoody, C. E. Kilbourne, and H. W. Howgate, acting signal-officers and assistants, in charge, respectively, of records, general correspondence, orders and enlistments; of the general charge of instruction, and general supervision of non-commissioned officers and assistants on station-duty; the receipt, record, and publication of daily weather reports; and of the property division.

Assistants First Lieuts. J. P. Story, H. H. C. Dunwoody, and Robert Craig, acting signal-officers, and Cleveland Abbe, A. M., have alternated, under the direction of the Chief Signal-Officer, in immediate charge of the issue of cautionary signals, synopses and indications, and the preparation of the publications of the office.

First Lieuts. A. W. Greely and J. A. Buchanan, and Second Lieut. James Allen, acting signal-officers, have been attached to the office as inspectors.

The Chief Signal-Officer is pleased to refer to a year of faithful attention to duty on the part of these officers, as also on the part of those serving at Fort Whipple and on detached duty elsewhere.

The aggregate of office correspondence has become very large, embracing many thousands of communications, exclusive of telegrams sent and received The record is herewith. (Paper 6.)

The office is in communication with numerous foreign correspondents, having now official relations with the scientific men and the chiefs of meteorological service of nearly every prominent power in the Northern Hemisphere. It has become the acknowledged center for meteorological information on this continent; it has succeeded in connecting itself with the meteorological work of the world. It maintains a system of exchanges valuable and interesting at once to those who send and who receive, more extensive, prompt, and regular than would have been possible for the service without the aid of military organization for its members and the incident power of regulation and control which accompanies it. Cooperation wherever sought has been cordial and courteous.

The preparation of statistics and reports upon especial request for the uses of individuals or institutions and journals which wish to publish data has become a work of magnitude. The numerous applications for information on various subjects, many of them only indirectly connected with the duties of the office, have required of themselves much attention. Requests for consolidated data or the discussion of meteorological facts which require in compliance days of labor are made at times apparently without thought of how much has been asked for. It has been the rule of the office to furnish whatever has been in its power whenever it has been considered to be for the public benefit or to aid in the work of a recognized scholar. (Paper 7.)

The work in the property division of the office has been carefully systematized. It has become extensive with the increasing duties of the service. To meet as it was hoped the views of Congress, an economy has been practiced which has reached the verge of parsimony. The shrinkage of values everywhere has permitted a reduction of expendi-

tures, without which the continuation of the work of the office in its present scope with the appropriations now available, would have been impracticable.

A number of useful maps and charts have been prepared in the map-room of the office. The work of this room, offering as it does in synoptic view and at a glance the results had from thousands of observations extended over years of labor, and condensed after careful consideration in the lines of the charting, becomes yearly more valuable for the studies daily necessary. A glance at a chart exhibits to the student what else could be known only by the personal experience of years. It is in contemplation to increase the force employed and the work of the room, systematizing, in this way, the series of generalizations established by the work of the service. On the success of this duty will rest much of the permanent advance to be hoped for.

Ninety-one dollars and ninety-three cents have been received during the year from the sale of maps and other office publications, in accordance with the act of Congress approved March 3, 1874, authorizing such sales.

The many inquiries received at the office as to the manner in which the publications of the office may be procured, indicate the want of a general knowledge of the fact that the sale of copies of any or all of its publications, or of any maps or papers regularly issued by it, is authorized by law to be made to any applicant upon the payment of the actual cost to the United States, of the paper or publication sought for. Valuable data of the office are always procurable in this way, for the minute investigation and careful study of any sufficiently interested in the subjects to which they have reference, by paying the very moderate cost of paper and printing.

Six hundred and seventy-eight meteorological instruments have been purchased for station use, and eight hundred and seventy have been issued during the year ending June 30, 1877. The practice of sending instruments by mail, in the charge of postal agents, under the special arrangement for this purpose made with the Postmaster-General, has continued to be successful, and is of material benefit to the office. The superintendent of the railway mail service and his assistants of the Post-Office Department, as well as the agents of that department generally, have rendered careful and energetic aid in this transportation. Such aid is important to a service now ramifying into every portion of the United States.

It is by the aid of the postal agents and the facilities had through them for the conveyance of instruments over their routes that the wide distribution of meteorological apparatus, rendered necessary on seas and continents by the plans of observation and study now adopted, has become possible and will be maintained.

Fifteen anemometers, fifty-one hygrometers, eighteen rain-gauges, and three water-thermometers, have been issued to Commodore Daniel Ammen, Chief of the Bureau of Navigation, of the Navy Department, for use on vessels of the United States Navy, in making, in co-operation with this office the naval series of simultaneous observations directed by the honorable the Secretary of the Navy, in General Order No. 220, dated December 25, 1876. A number of instruments have been furnished for temporary use on vessels of the commercial marine, engaged in similar co-operation upon the marine series of observations.

The library of the office now contains three thousand six hundred and thirty-two bound volumes, and six hundred and seventy-four pamphlets, being an increase since the date of the last annual report of three hundred and twenty-two bound volums and eighty-five pamphlets

These works have been carefully catalogued and are filed for ready reference. The list comprises a useful and extensive collection for meteorological research, with other works relating to the several duties of the service. Copies of some of the volumes are not to be found elsewhere, and are especially valuable. A number of important works have been obtained, without cost to the United States, from foreign societies and associations, in courteous exchange for the publications of the office. (Paper 8.)

The total number of stations of observation in operation, and communicating with the office, on the date June 30, 1877, was one hundred and fifty-nine, comprised within the territory of the United States and maintained for the Signal Service. There are included in this number the stations upon the United States telegraph-lines in charge of this office, and the special river stations, from which reports are regularly received. Reports have been received also from seventeen stations established by the authorities of the Dominion of Canada and from two stations located in the West India and Bermuda Islands. The number of stations from which full telegraphic reports are received at this office tri-daily is ninety-five; the number from which one full telegraphic report only is received daily is thirty-two. There is one station from which two full telegraphic reports are received daily. The total number of stations of all classes from which telegraphic reports are received daily is one hundred and twenty-eight.

The sums expended for the service secure for the United States not only the reports from the officially established stations, but incidentally those had from the eight hundred and seventy-seven additional stations to which reference is made elsewhere.

The following is the record of regular stations for the year ending June 30, 1877:

ALBANY, NEW YORK.

[*Official number*, 16.]

Latitude	42° 40′
Longitude	73° 45′
Mean barometer for the year ending June 30, 1877	29.976
Mean temperature for the year ending June 30, 1877	46°.7
Amount of rain-fall for the year ending June 30, 1877	31.81 inches.

No change was made in location of office or instruments during the year. Sergeant Alois Dunhauser was ordered to the office of Chief Signal-Officer, July 5, 1876, for discharge; re-enlisted; was promoted to sergeant and reassigned to duty at Albany, N. Y., July 8, 1876, and continues in charge of the station.

Corporal R. R. Rogers was ordered to Fort Whipple, Va., July 24, 1876, for promotion. Private Benjamin F. Clarke was ordered to Fort Whipple, Va., December 21, 1876, for discharge. The conduct of the men on duty has been excellent.

Canal navigation closed December 1, 1876, and opened May 8, 1877.

Testimonials of the value of the weather reports are daily received from merchants and professional men, and all citizens derive more or less benefit from them, more especially, however, the merchants.

In the Albany High School, meteorology is taught from the daily weather reports.

The station was inspected in December, 1876, and June, 1877, and was found in good condition.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1877	112,234
Number of Bulletins (manifold) issued during the year ending June 30, 1877	8,359
Number of Form 15 (manifold) issued during the year ending June 30, 1877	1,052
Number of Form 22 issued during the year ending June 30, 1877	88
Total	121,733

ALPENA, MICHIGAN.

[*Official number*, 85.]

Latitude	45° 5′
Longitude	83° 28′
Mean barometer for the year ending June 30, 1877	29.982
Mean temperature for the year ending June 30, 1877	41°.2
Amount of rain-fall for the year ending June 30, 1877	25.81 inches.

Sergeant Ray continues in charge of the station. He has no assistant. No change has been made in the location of the office (corner of Fletcher and Dock streets) nor in the position of any of the instruments in use. The station was inspected in August, 1876, and found to be in good condition. The conduct and standing of Sergeant Ray has been excellent.

Twenty-three cautionary signals were ordered for this station during the year, of which number nine are reported by the observer to have been justified and fourteen not justified.

The following remarks are made by the observer in reference to the display of the signals:

July 27 *to July* 28, 1876.—Nearly all vessels remained in during the display.

August 24 *to* 25, 1876.—Sailing-vessels remained in port or anchored in the bay. Rough weather out on the lake.

September 3 *and* 4, 1876.—Sailing-vessels remained in port.

September 6, 1876.—Sailing-vessels remained in port on account of the signal.

October 2 *and* 3, 1876.—Sailing-vessels in readiness to leave port remained in on account of the signal.

October 5 *to* 7, 1876.—Sailing-vessels remained in port during the display; also, the mail-boat delayed her departure on account of the signal.

October 9 *and* 10, 1876.—Signal order received too late, the telegraph line being down. No vessels arrived or left port during the gale.

October 20 *and* 21, 1876.—All vessels remained in port; steamers arriving report heavy winds out on the lake.

November 2 *and* 3, 1876.—Sailing-vessels in readiness to leave remained in port on account of the signal.

November 6 *and* 7, 1876.—The order to hoist signal was received one day late, owing to the telegraph line being down. Sailing-vessels remained in port until the signal was lowered.

November 21 *and* 22, 1876.—All sailing-vessels remained in port.

November 30 *and December* 1, 1876.—No vessels arrived or departed during the display. Light and heavy snow prevailed. The river froze over during the night.

December 8 *to* 10, 1876.—The propeller Robert Holland, the last vessel for the season, left port for Detroit on the 8th inst. Bay froze over during the night; navigation closed; storm blew telegraph-lines down.

December 12 *and* 13, 1876.—The wind carried the ice out of the bay.

December 14 *and* 15, 1876.—Bay froze over.

December 15 *and* 18, 1876.—Bay frozen over; navigation still closed; telegraph-lines were blown down; order down signals not received until the 18th instant.

March 31 *to April* 2, 1877.—Rain and snow fell. Telegraph-line down. The bay is now clear of ice.

April 27 *to* 29, 1877.—Steam-barge S. C. Baldwin struck on a reef in Thunder Bay and sunk. The crew were saved by the United States life-saving crew. No vessels arrived or left port during the display. Gale was accompanied by rain, sleet, and snow.

The cautionary signal displays have been generally regarded by all persons interested in lake navigation, all of whom manifest a lively interest for the support and continuance of the signal service.

Navigation closed and bay frozen over on December 8th. Robert Holland (propeller), the last vessel for the season, departed for Detroit on same date, with a cargo, consisting of passengers and merchandise.

Ice in the bay cleared out April 1, with high northwest winds, and the first vessel of the season (schooner Sea Bird), without cargo, arrived at this port April 20, and the steamer Dove, United States mail-boat, arrived on the following day.

The local observations are published in the two weekly papers of the city.

ATLANTIC CITY, NEW JERSEY.

[*Official number*, 116.]

Latitude	39° 22′
Longitude	74° 25
Mean barometer for the year ending June 30, 1877	30.015
Mean temperature for the year ending June 30, 1877	50°.5
Amount of rain-fall for the year ending June 30, 1877	33.19 inches.

No change has been made in location of office since last report. Sergeant Cramer continues in charge and has one assistant. Private D. Brooks was transferred December 27, 1876, to Cape Hatteras, North Carolina. Private F. Burke was assigned December 27, 1876, relieved March 16, 1877, and discharged the service for neglect of duty. Private E. McGovern, assigned March 16, 1877, promoted to be sergeant, and transferred May 21, 1877, to Virginia City, Mont. Private F. W. Kinne, assigned May 22, 1877, transferred June 18, 1877, to Barnegat, N. J. Private T. Cleary, assigned May 22, 1877. Private M. B. White, assigned temporarily May 22, 1877.

The station was inspected in March, 1877, and found in good condition. Seventy-two cautionary signals were ordered during the year, of which number thirty are reported as having been justified and forty-two not justified.

In reference to the display of cautionary signals, the sergeant remarks as follows:

September 16 *to* 18, 1876. This office was surrounded with three feet of water; the light-house and several cottages were also surrounded. The wind destroyed trees and tore valuable canvas-tents to shreds.

November 2 *and* 3, 1876.—Vessels often come in sight of the station for signs of the weather, and if the flag is up, they are often seen to put out to sea.

November 18 *to* 21, 1876.—The storm was severe; the high and heavy sea cut away the beach considerably, and washing over the meadows, so damaged the railroad as to interrupt all transportation since the 18th. Timely warning of the storm was given.

May 2 *and* 3, 1877.—The yacht Ida ventured out while the signal was up; becoming unmanageable, ran on the bar; received assistance from the life-saving crew.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	874
Number of Form 15 (manifold) issued during the year ending June 30, 1877	1,070
Number of Form 22 issued during the year ending June 30, 1877	11
Total	1,955

AUGUSTA, GEORGIA.

[*Official number*, 23.]

Latitude	33° 28′
Longitude	81° 54′
Mean barometer for the year ending June 30, 1877	30.062
Mean temperature for the year ending June 30, 1877	63°.2
Amount of rain-fall for the year ending June 30, 1877	50.89 inches.

No change was made in location of office during the year. The printing of farmers' bulletins at this station was discontinued July 31, 1876. Sergeant Bessant remains in charge and has one assistant.

Private G. W. Hay was relieved July 24, 1876, for promotion.

Private George Allen was relieved January 11, 1877, for discharge.

Private F. L. Pinkham was assigned February 3, 1877.

The sergeant in charge reports that considerable interest is taken in the service, and the "Indications" are eagerly sought after and great reliance placed upon them, especially by persons engaged in the cotton traffic.

The station was inspected in June, 1877, and found in a satisfactory condition.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1877	2,275
Number of Bulletins (manifold) issued during the year ending June 30, 1877	3,700
Number of Local Reports issued during the year ending June 30, 1877	476
Number of Form 15 (manifold) issued during the year ending June 30, 1877	50
Number of Form 22 issued during the year ending June 30, 1877	41
Total	6,542

BALTIMORE, MARYLAND.

[*Official number*, 18.]

Latitude	39° 18′
Longitude	76° 38′
Mean barometer for the year ending June 30, 1877	30.040
Mean temperature for the year ending June 30, 1877	54°.5
Amount of rain-fall for the year ending June 30, 1877	43.10 inches.

Sergeant R. J. Bell was relieved May 18, 1877, and Sergeant E. W. McGann assigned to this station. Two assistants were transferred to the Office of the Chief Signal Officer during the year, and two others assigned to duty at this station. The station was inspected in November, 1876, and found in good order. Vessel-reports have been received from Cape Henry throughout the year, and since May 30 from Cape May. These reports are posted in the Merchants' Exchange, and give great satisfaction. No changes have been made in the position of the instruments, nor is any considered necessary. The members of the meteorological committees take great interest in everything pertaining to the service, and pay monthly visits of inspection to the office. The records of the office have been used as testimony in the Court of Common Pleas in this city. Sixteen cautionary signals have been displayed, of which number the sergeant reports four as justified and twelve not justified. The signals are duplicated at Dudley's Observatory, on Federal Hill. The sergeant remarks as follows in reference to some of these displays:

September 16 *to* 18, 1876.—Houses unroofed, trees, awnings, signs, telegraph-lines in and about the city blown down, warehouses damaged by the water, which filled the cellars; also stores and dwellings situated in the lower part of the city. In the harbor many vessels dragged their anchors. The damage done will probably exceed that of the storm of February 2, 1876. Great excitement during the day; office visited by a large number of leading merchants in quest of information of the storm along the coast, and the damage done to shipping at Cape Henry, Virginia.

"Editorial," Baltimore American of September 18, 1876: * * * * "It is certain, though, that hurricanes have raged along the coast and placed shipping in great danger. The hope that it has mainly escaped lies in the fact that the Signal Bureau gave ample warning of the northward movement of the storm, and that it had been preceded by a steadily-falling barometer."

The Baltimore Gazette of September 18, 1876, says: "The storm that raged on Saturday night and all day yesterday was of unusual violence along the Atlantic coast, and the storm-signals were displayed from New London to Key West * * *."

October 14 *and* 15, 1876.—At more exposed and elevated places the wind blew with a velocity of 40 miles per hour. Slight damages reported. Many vessels remained in port on account of the display, which would otherwise have gone out and encountered dangerous winds on the bay.

December 9, 1876.—A great amount of damage has been done through the city. A number of coasting-vessels which left were compelled to return, and a large number are overdue. The amount of damage will probably reach $5,000. It is estimated that the wind, in exposed portions of the city, reached 45 miles per hour.

February 12 *and* 13, 1877.—The display had the effect of keeping vessels in harbor, thereby avoiding a fearful gale on the bay.

March 28, 1877.—Damage to vessels in harbor, and to property in the city, is estimated at $400.

April 8 *to* 10, 1877.—Considerable detention occurred to coastwise and bay vessels, several of which intermitted their trips entirely owing to the display. In exposed places the velocity was much greater than at the station. On the bay several distressing disasters occurred, among which was the loss of a schooner with the captain, mate, and a deck-hand; also one man from the steamer Maggie.

PUBLICATIONS.

Number of Manifold Bulletins issued during the year ending June 30, 1877	4,416
Number of Local Reports issued during the year ending June 30, 1877	2,454
Number of Form 15 (manifold) issued during the year ending June 30, 1877	3,371
Number of Form 22 issued during the year ending June 30, 1877	99
Total	10,340

BANGOR, MAINE.

[*Official number*, 111.]

Corporal E. D. McKenna, relieved March 29, 1877, ordered to Fort Whipple for discharge. Private L. N. Jesunofsky was assigned to duty at this station March 29, 1877. The work of the station is limited to the issue of the Farmers' Bulletin. No change was made in the location of office during the year. The station was inspected in July, 1876, and found in good order.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1877	55,804

BARNEGAT, NEW JERSEY.

[*Official number*, 115.]

Latitude	39° 48′
Longitude	74° 9′
Mean barometer for the year ending June 30, 1877	30.004
Mean temperature for the year ending June 30, 1877	50°.3
Amount of rain-fall for the year ending June 30, 1877	43.17 inches.

Sergeant R. J. Lewis was relieved March 13, 1877, and succeeded by Sergeant F. Pierce, who remains in charge. Private G. V. Philips was transferred July 6, 1876, to Cape May, N. J., and replaced by Private F. Greene. The station was inspected in November, 1876, and March, 1877, and was found in excellent condition. No change has been made in the location of the office or the position of the instruments. On June 18, Sergeant Pierce, with Privates Cleary and Harrison, started north, in compliance with instructions received from the Chief Signal-Officer, to reinsulate and put in thorough repair the coast telegraph-line from

Barnegat to Sandy Hook. At the present writing this work is completed. From January 13 until April 14, during a break in the cable crossing Barnegat Inlet, communication was kept up, by means of flag and torch signals, with Sandy Hook. A station was opened on the north side of the inlet for this purpose with Sergeant Laurens in charge and Private Cleary assistant, and in co-operation with the force at this station messages, reports, &c., relayed by the above means. Two wrecks occurred during the past six months in this vicinity. First, the American ship Simla, from Marseilles for New York, came ashore ten miles south of the station at 11.30 p. m., January 6. The circumstance was promptly reported and all messages to owners and underwriters forwarded to the Chief Signal-Officer. Second, the Swedish brig Magnus, from Pernambuco for New York, came ashore during the prevalence of a dense fog, four miles south of the station, at 3.30 a. m., of April 19. The disaster was reported to the Chief Signal-Officer within six hours of its occurrence. The first information received by parties interested was sent from this station through the Chief Signal-Officer, and on that information assistance was promptly sent and the brig and most of her cargo saved.

Sixty-six cautionary signals were displayed during the year, of which number forty-four were reported by the sergeant as justified and twenty-two not justified. The sergeant remarks in reference to some of these displays:

August 2 *and* 3, 1876.—An abandoned schooner washed ashore about two miles north of station.

September 16 *to* 18, 1876.—The flag-staff was broken on the morning of the 17th instant.

December 15 *and* 16, 1876.—Telegraph-line being down, signal orders not received.

January 6 *and* 7, 1877.—The ship Simla went ashore seven miles south of station. Vessel in ballast. No lives lost.

March 24 *to* 30, 1877.—Gale accompanied by a dense fog, rain, and a heavy sea, also thunder and lightning and snow.

April 19 *and* 20, 1877.—Brig Magnus went ashore during fog, which preceded storm.

April 28 *to* 30, 1877.—Fog prevailing during display, making navigation along the coast dangerous.

May 2 *and* 3, 1877.—Several schooners came inside for shelter.

June 21 *and* 22, 1877.—Numerous fishing-boats returned to mainland when the signal was displayed.

June 30 *to July* 2, 1877.—Severe damage done to crops at Barnegat and Waretown; it was particularly severe at a point three miles southwest of station.

BENTON, MONTANA TERRITORY.

[*Official number*, 71.]

Latitude	47° 52′
Longitude	110° 30′

Station discontinued July 31, 1876.

Sergeant J. F. Tenney relieved from duty July 31, 1876, and ordered to Fort Whipple, Virginia.

BISMARCK, DAKOTA TERRITORY.

[*Official number*, 104.]

Latitude	46° 48′
Longitude	100° 38′
Mean barometer for the year ending June 30, 1877	29.867
Mean temperature for the year ending June 30, 1877	38°.8
Amount of rain-fall for the year ending June 30, 1877	28.34 inches.

Sergeant J. H. Smith was relieved July 5, 1876, for discharge. Sergeant N. G. Brewer, assigned July 5, 1876; relieved February 20, 1877, for neglect of duty. Sergeant D. T. Flannery assigned to station February 20, 1877, and remains in charge. No change was made in the location of office during the year. The station was inspected in September, 1876, and found in fair condition.

The publications at this station are limited to the local observations, which are printed in the Bismarck Tribune.

BOISE CITY, IDAHO TERRITORY.

[*Official number*, 145.]

Latitude	43° 40′
Longitude	116° 6′

Sergeant B. E. Light was ordered to establish a station at this point, per S. O. No. 62, May 21, 1877, and to commence observations July 1, 1877.

BOSTON, MASSACHUSETTS.

[*Official number*, 13.]

Latitude	42° 21′
Longitude	71° 4
Mean barometer for the year ending June 30, 1877	29.962
Mean temperature for the year ending June 30, 1877	47°.6
Amount of rain-fall for the year ending June 30, 1877	51.68 inches.

Sergeant George H. Rohe was transferred November 23, 1876, to Savannah, Ga. Sergt. O. Parker assigned to duty at this station, and remains in charge. One assistant was relieved from station for neglect of duty, one ordered to Fort Whipple, Va., for promotion, and one ordered to Office of the Chief Signal-Officer for duty. F. W. Conrad, civilian printer, was assigned to station May 13, 1877. The present force consists of one sergeant, two assistants, and one civilian printer.

The station was inspected in August, 1876, and May, 1877, and was found in fair condition. It has since been repaired. Six hundred and fifty-nine post-offices and thirty-two individuals have been regularly supplied with Farmers' Bulletins from this station.

No change has been made in the location of office or instruments, and the present location is advantageous and satisfactory in every way.

Forty-six cautionary signals were displayed during the year, of which number thirty-two are reported as justified at the station, and fourteen not justified. The sergeant makes the following remarks relative to the display of these signals:

September 17 *and* 18, 1876.—The display was favorably commented upon by several newspapers.

November 19 *to* 22, 1876.—An unknown schooner was driven out of Gloucester Harbor and wrecked on Nix's Mate, a rock in Massachusetts Bay. A coasting-schooner, the Taglione, of 28 tons, was wrecked on "The Graves," at the entrance of Boston Harbor. Considerable damage was done in the city and surrounding country. The rain-fall was very heavy, being 6.37 inches, 5.43 inches of which fell in 24 hours.

December 9 *and* 10, 1876.—General notice was taken of the signal, and many ship-agents visited the office for information. No vessels left port except one Cunard steamer. A number of disasters occurred to shipping. So far, no loss of life is reported. A number of seamen were badly frost-bitten.

December 15, 1876.—Schooner Lucy capsized and sunk off Eastern Point; no lives lost.

December 16 *and* 17, 1876.—Vessels remained in port.

December 29 *and* 30, 1876.—General notice was taken of the signal. Vessels in harbor secured for the gale; those in the offing put out to sea. A schooner loaded with lumber was wrecked on the rocks at Marblehead. All newspapers noticed the display,

and the Daily Post says editorially: "The prompt display of the cautionary flag, by the Signal-Service Bureau, enabled those vessels which were in the harbor to run into safe quarters, while those too far outside to avail themselves of such a haven stood out to sea, and so escaped the danger of a lee shore."

January 20 *and* 21, 1877.—The signal was noticed by vessels in the harbor, and precautions taken to prevent damage from jamming or ice-drifts.

March 2 *and* 3, 1877.—Vessels in the harbor took precaution to prevent being injured by the gale. The office wind-vane was bent over by the gale. No disasters reported.

March 8 *to* 10, 1877.—Vessels in harbor secured themselves in consequence of the warning-signal, and those near harbor either secured its shelter or a good offing. Two loaded schooners were blown ashore on Mud Flats in the harbor, but sustained little damage. Fences and chimneys were blown down, lightning-rods twisted, plate-glass windows broken, slates blown off of roofs, and other accidents. No serious damage done in the city or vicinity.

March 25 *to* 29, 1877.—A dense fog prevailed during gale. Many coasting-vessels about to sail were detained by the signal, and saved from risk of disasters. No marine disasters; much damage done by floods in the country by excessive rains.

April 8 *to* 10, 1877.—The office was visited by numerous persons, who, notwithstanding the good weather, evinced so much confidence in the service as to believe a storm must follow.

Sergeant Parker reports that the value of the "indications" is recognized by all classes of citizens.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1877	207,048
Number of Bulletins (manifold) issued during the year ending June 30, 1877	8,891
Number of Local Reports issued during the year ending June 30, 1877	1,428
Number of Form 22 issued during the year ending June 30, 1877	245
Total	217,612

BRECKENRIDGE, MINNESOTA.

[*Official number*, 82.]

Latitude	46° 11′
Longitude	96° 17′
Mean barometer for the year ending June 30, 1877	29.985
Mean temperature for the year ending June 30, 1877	37°.0
Amount of rain-fall for the year ending June 30, 1877	24.29 inches.

Sergeant M. L. Hearne relieved February 3, 1877, on account of errors in meteorological reports, and Sergeant B. C. Anderson assigned to the station. No change in location of office or instruments has been made during the past year. The station was inspected by Lieut. James Allen, A. S. O., in September, 1876, and was found in excellent condition. The following is an extract from Lieutenant Allen's report:

This station is a very important one to farmers living along the line of the Saint Paul and Pacific Railroad. Their attention was first called to the benefits to be derived from information that could be furnished from this point by the great storm of January, 1872, in which it is estimated that upwards of one hundred people perished. Reports from this station are called for daily, and during the winter many times every day, and it is believed that it has been the means, every winter, of saving many lives.

BUFFALO, NEW YORK.

[*Official number*, 33.]

Latitude	42° 53′
Longitude	78° 55′
Mean barometer for the year ending June 30, 1877	29.974
Mean temperature for the year ending June 30, 1877	45°.7
Amount of rain-fall for the year ending June 30, 1877	35.64 inches.

Sergeant E. B. Garriott was temporarily assigned to duty November 3, 1876, and remained until February 12, when he was transferred to Rochester, N. Y. One assistant has been ordered to Fort Whipple, Va., for promotion, and two have been transferred to other stations.

Sergeant Purssell continues in charge of the station, and has one assistant and a civilian printer, who began printing the bulletins April 23, 1877.

The station was inspected in January, and also in June, 1877, and was found in good condition. The location of the office and position of the instruments remains as at the date of last report. Three hundred and ten post-offices and seven individuals have been supplied with farmers' bulletins from this station. The following extracts are made from the semi-annual report of the sergeant:

The benefits derived from the farmers' bulletin are gratefully acknowledged by hundreds of the better class of farmers who have called at this office, and many applications for the bulletin are received from post-offices at too great a distance to be served. Navigation closed December 6, 1876, a steamer of the Union Transportation Company being the last vessel to arrive. The harbor opened at this port on the 14th of April, but the first vessel (tug John Aiken) did not clear until the 17th. The first arrival was the schooner Levi Casey, from Cleveland, on the 25th of April, with 20,000 bushels of corn. During the month of April a new cautionary signal-lamp was erected on the roof of the observatory on Weed's block, which supplies a want long felt by lake-men, that of a light which could be seen from all points of the harbor and adjacent lake, and which could not be mistaken for any other light. The new light more than meets all these requirements, as it is very powerful, and placed at such an elevation as to command a view of the entire city and harbor. It is illuminated by thirteen large gas-jets. As in former years, the meteorological committee, the Board of Trade, Tug Association, Capt. E. P. Door, Alonzo Richmond, and many other prominent institutions and individuals, remain the steadfast friends of the service, and stand ready to aid in its advancement.

Twenty-nine cautionary signals have been displayed, of which number thirteen are reported as justified on the station and sixteen not justified. The following are the remarks of the sergeant in charge of station relative to the display of these signals:

July 5, 1876.—Several vessels dragged their anchors at Toronto, and vessels out were damaged in canvas. Bark Canada broke from her fastenings and went ashore at Port Colborne. Two men were struck by lightning at Elmira, one killed and the other seriously injured. Schooners Wm. Hunter and Dunford had their stems injured. A yacht was seen to upset off Oakville, Ont.; sea so high that no assistance could be rendered, and all on board are supposed to be lost. Schooner New Dominion lost her bulwarks. The trains passing over the Falls Branch of Central Railroad were drenched, the waves passing clear over the cars. At Buffalo the water rose over the docks, and submerged cellars and basements in the lower part of the city. The canal was overflowed and washed out Two boys were injured by flying lumber. The water broke over the outer breakwater in huge waves, sending spray fifty or more feet high.

July 27 and 28, 1876.—Heavy winds reported on the lake.

August 25, 1876.—The warning was favorably regarded by all classes of citizens. There was heavy weather on the lake.

September 17 *and* 18, 1876.—The signal was considered by all as very opportune, and was generally heeded by mariners. The wind blew steadily at 24 to 25 miles per hour, for six or eight hours, and nearly two inches of rain fell.

September 27 to 29, 1876.—There was undoubtedly a great saving of life and property by the signals of the 27th and 28th, as the storm is known to have been severe on Lake Erie. A large fleet of vessels was ready to leave port on the 27th, but remained, with a few exceptions; some of those that left were compelled to put back. The regular line of propellers did not leave until after consulting the weather reports at office. Visitors to the office were very numerous, and in almost every case acted upon the advice of this office and remained in port. Very few vessels left port while the signal remained in view, although some of them were at considerable daily expense.

October 2 *to* 4, 1876.—All vessels remained in port. Lake captains who visited the office during the storm state that, in their opinion, the Buffalo signal alone was the means of saving many vessels from partial if not total loss. A hearty and thankful appreciation of the benefits of the storm-warning is evinced by all captains and owners of vessels in this city.

October 5 *to* 8, 1876.—A fleet of barges and vessels which left port on the 5th instant, were all driven back, excepting one, and regained the harbor with much difficulty. The gale was extremely severe, and but for the timely warning must have caused a great loss of life and property. The mate of the schooner Zach Chandler blown overboard and drowned. During the past two days of the storm the office has been besieged with lake captains and owners of vessels. They all profess the most implicit confidence in the storm-warnings, and were profuse in their expressions of thankfulness and obligations to the service.

October 9 *and* 10, 1876.—Gale very severe on the lake. All vessels remained in port on account of signal and thereby escaped great loss. Many vessels which went out before the gale were driven back and one went ashore. Lake-men extremely grateful for the warning.

October 16 *and* 17, 1876.—Most severe blow of the season, lasting 24 hours, with an average of 30 miles per hour.

November 2 *and* 3, 1876.—Storm very severe. All vessels remained in port and escaped the gale, except one; she was driven back. The display undoubtedly prevented much loss of property. No disasters, as far as known.

Norember 22 *and* 23, 1876.—The gale was accompanied by rain, snow, and sleet. No damage to shipping reported, the vessels in the harbor having had ample warning of the approach of the storm. Several vessels that were out had great difficulty in getting into port. The Buffalo Advertiser of November 22, 1876, says: "From all accounts, the gale of the past few days was one of the severest felt upon the Atlantic coast for many years. Thus far the reports of disasters have not come up to expectations." * * *

December 1 *and* 2, 1876.—The snow-storm and low temperature accompanying the wind made navigation very dangerous. No vessels left port during the display.

December 8 *to* 10, 1876.—No damage to shipping; all vessels laid up for the winter.

December 14 *to* 16, 1876.—No disasters. No vessels were out. A velocity of 60 miles in gusts of a few minutes' duration.

December 17 *and* 18, 1876.—Harbor and lake frozen.

January 13 *and* 14, 1877.—Trains stopped on the railroads.

March 31 *to April* 2, 1877.—Navigation not yet opened.

April 8 *to* 10, 1877.—Much comment was made on the low velocity of wind here while such high ones prevailed at nearly all points on the lake during this storm.

April 19 *and* 20, 1877.—No vessels left port. No ice at this end of the lake.

April 27 *to* 29, 1877.—On 28th, several steam-vessels left port.

June 5 *and* 6, 1877.—A northeast wind is favorable for vessels leaving port; several left during the display.

June 9 *and* 10, 1877.—Mate blown overboard from barge Lathrop. Schooner Garibaldi was blown against pier as she was entering the river and lost her jib-boom. A heavy iron railing was blown from roof of the Washington Hotel. Gale very severe on the lake.

June 30 *to July* 2, 1877—Heavy squall on the 1st instant, with rain, thunder, and lightning. No vessels left port; even the regular passenger propellers remained inside.

Referring to the storm of November 22, 23, 1876, the Commercial Advertiser of November 22, 1876, remarks as follows:

"The signal flag has warned those interested in lake navigation in due time. Millions of dollars' worth of property are saved every year by the display of that piece of red bunting."

PUBLICATIONS.

Number of Farmer's Bulletins issued during the year ending June 30, 1877	91,978
Number of Bulletins (manifold) issued during the year ending June 30, 1877	7,964
Number of Local Reports issued during the year ending June 30, 1877	1,626
Number of Form 22 issued during the year ending June 30, 1877	85
Total	101,653

BURLINGTON, IOWA.

[*Official number*, 122.]

Latitude	40° 49′
Longitude	91° 07′

Corporal Henry Pennywitt was relieved July 11, 1876, for discharge. Sergeant F. W. Conrad was assigned July 11, 1876, and relieved November 7, 1876, for discharge. Private James Kenealy was assigned No-

vember 7, 1876, and transferred May 17, 1877, to Galveston, Tex. Corporal E. D. McKenna was assigned May 17, 1877, and continues in charge. One hundred and fifty post-offices have been supplied with Farmers' Bulletins from this station. The office was not inspected during the year. Meteorological reports are not received from this station.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1877	49,645

BURLINGTON, VERMONT.

[*Official number*, 45.]

Latitude	44° 29′
Longitude	73° 15′
Mean barometer for the year ending June 30, 1877	29.971
Mean temperature for the year ending June 30, 1877	45°.9
Amount of rain-fall for the year ending June 30, 1877	24.78 inches

Sergeant Wyllys A. Chapman was relieved March 7, 1877, for discharge, and Sergeant J. F. Tenney assigned to this station. No change has been made in location of office or position of instruments since last report. Only local reports are published at this station. The station was inspected in July, 1876, and June, 1877, and was found to be in good condition.

CAIRO, ILLINOIS.

[*Official number*, 53.]

Latitude	37° 00′
Longitude	87° 12′
Mean barometer for the year ending June 30, 1877	30.055
Mean temperature for the year ending June 30, 1877	56°.2
Amount of rain-fall for the year ending June 30, 1877	29.92 inches.

Sergeant J. M. Watson remains in charge of station. Private S. B. Lum was relieved November 3, 1876, for insubordination. Private P. C. Guthrie was assigned to station November 3, 1876. The station was inspected in September, 1876, and March, 1877, and found to be in good condition. No change has been made in the location of office, elevation of instruments, or in number of reports received since last report. The sergeant reports that great interest is taken in the service, and that the reports are studied very closely by the merchants and river-men. Highest water in river, 40 feet 7 inches, April 14, 1877; lowest water, 0 feet 3 inches, December 30, 1876—measurements made from low-water mark of December, 1871.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	5,501
Number of Local Reports issued during the year ending June 30, 1877	657
Number of Form 22 issued during the year ending June 30, 1877	77
Number of Form 26 issued during the year ending June 30, 1877	4,697
Total	10,932

CAPE HENRY, VIRGINIA.

[*Official number*, 118.]

Latitude	36° 56′
Longitude	76° 00′
Mean barometer for the year ending June 30, 1877	30.022
Mean temperature for the year ending June 30, 1877	56°.9
Amount of rain-fall for the year ending June 30, 1877	63.83 inches.

Sergeant William Stein was ordered to Fort Monroe, Virginia, December 7, 1876, for discharge; discharged, re-enlisted, promoted to be sergeant,

and reassigned December 22, 1876; transferred May 18, 1877, to Norfolk, Va. Sergeant R. J. Bell was assigned May 18, 1877, and remains in charge of station. Sergeant R. R. Rodgers was assigned December 13, 1876, as assistant; transferred May 21, 1877, to Red Bluff, Cal. One assistant is on duty at this station. Sergeant Stein distinguished himself for attention to and faithful performance of duty at his station, and was complimented by the Chief Signal-Officer in a telegram dated March 27, 1877.

No changes have taken place in the location of office and instruments since last report. The reporting of vessels passing the capes has continued.

The station has not been inspected formally since last report.

Sixty-two cautionary signals were displayed during the year, of which numbers the sergeant reports thirty-eight justified and twenty-four not justified, and makes the following remarks relative to the display:

September 16 *to* 18, 1876.—Schooner Anna W. Barker driven ashore eighteen miles south of station. Telegraph-line down south of station; was prostrated at several places for two or three miles.

December 8 *to* 10, 1876.—The anemometer was carried away on the 9th instant. Serious damage was done by gale to schooner Fanny K. Shaw, ashore near station.

January 15 *and* 16, 1877.—Italian bark Silla ran ashore opposite station during heavy fog prevailing in the night.

January 17 *and* 18, 1877.—Italian bark Carpioni ran ashore twenty miles south of station during the prevailing fog.

March 21 *to* 23, 1877.—English ship Winchester, from Liverpool, in ballast, bound to Norfolk, went ashore during foggy weather preceding the storm; unusually heavy sea, on account of which the surf-boat of life-saving station No. 1 was driven back twice while attempting to board the stranded vessel. No lives lost.

March 24 *to* 29, 1877.—On the morning of the 26th instant, during a heavy fog, the Norwegian bark Pantzer, and Italian barks Monte Tabor and Franceshino, all in ballast, bound for Baltimore, ran ashore within a mile of each other, near the station. Bark Pantzer proved a total loss; bark Franceshino got afloat the same evening; the bark Monte Tabor remains aground. No lives lost.

A full report of this storm will be found in a special paper.

April 8 *to* 11, 1877.—Anemometer-cups blown off. Numerous marine disasters reported on the coast. No particulars can be ascertained. The sea was the highest for many years and very destructive, washing away the sea-coast telegraph-line for miles in several places.

As in previous reports, I have to mention again an instance where this telegraph-line has been of immediate benefit to the shipping interest. On December 7, the schooner Fannie K. Shaw, from Saint Mary's, Georgia, and bound to Baltimore, with lumber, ran ashore opposite this station, and by means of telegraphic communication, assistance could be promptly secured, whereby the schooner was got afloat a few days after.

CAPE MAY, NEW JERSEY.

[*Official number*, 54.]

Latitude	38° 56′
Longitude	74° 58′
Mean barometer for the year ending June 30, 1877	30.016
Mean temperature for the year ending June 30, 1877	53° 1
Amount of rain-fall for the year ending June 30, 1877	43.82 inches.

Sergeant Townsend continues in charge of the station, and has given full satisfaction. Sergeant J. R. Williams was temporarily assigned during absence of Sergeant Townsend. Sergeant M. M. Sickler was assigned December 13, 1876, as assistant; transferred May 21, 1877, to Los Angeles, Cal. One assistant is on duty at this station. No changes have taken place in the location of office or instruments since my last semi-annual report. The telegraph-line was reinsulated between Cape May and Atlantic City by Sergeant T. F. Townsend and Privates Thomas Cleary and T. B. Harrison during the month of May. From and after

May 29, all vessels passing the station, whose names could be ascertained, have been reported to the Chief Signal-Officer. The same public interest prevails in the service, and its benefits are appreciated.

Seventy-one cautionary signals were displayed at this station during the year, of which number fifty-two were reported as justified, and nineteen not justified. Sergeant Townsend makes the following remarks relative to the display of some of these signals:

September 10 *and* 11, 1876.—Vessels took warning, secured a harbor, and remained during the display of signals.

September 16 *and* 18, 1876.—The schooner Thomas J. Lancaster driven ashore. Several houses at Cape May City badly damaged. Trees were broken and uprooted throughout the country. Some farms along the Delaware River were reported completely inundated, and the water over the first floors of dwellings. Pilots report considerable damage to shipping up the Delaware from dragging of anchors, &c. From the timely warnings given by the signal service and length of threatening weather previous to storm, most vessels were enabled to find a harbor or obtain an offing, which will account for the few shipwrecks along the coast. A large portion of the roof of Congress Hall Hotel was lifted in the air and carried about 200 yards, when it dropped on and completely demolished the greater portion of a double cottage.

November 18 *to* 21, 1876.—Gale very severe and the tide very high, doing considerable damage to improvements along sea-front. No damage to shipping as far as known.

CHARLESTON, SOUTH CAROLINA.

[*Official number*, 21.]

Latitude	32° 45′
Longitude	79° 55′
Mean barometer for the year ending June 30, 1877	30.065
Mean temperature for the year ending June 30, 1877	64°.9
Amount of rain-fall for the year ending June 30, 1877	92.42 inches.

Sergeant McGauran remains in charge of station and has performed all his duties in a satisfactory manner. Private E. H. Woods was relieved August 5, 1876, for discharge, and Private J. B. Pleasants was assigned to the station. Twenty cautionary signals have been displayed during the year, of which number the sergeant reports eight justified and twelve not justified. The following are extracts from the semi-annual report from this station relative to the display of these signals:

September 16 *and* 17, 1876.—The steamship Virginia, which left port after signal was hoisted, did not attempt to cross the bar; many seamen visited the office.

Press item, from the News and Courier of September 18, 1876: "On Saturday morning the storm-signal was displayed at the signal-office, and the prediction was verified."

October 19 *to* 21, 1876.—During the display nine and a half inches of rain fell in twenty-four hours—the heaviest known for years.

December 24 *and* 25, 1876.—Many persons connected with the coast-lines visited the office.

December 29 *and* 30, 1876.—The British bark Disco, freight-laden, which left on the 29th, while the signal was flying, stranded on the bar in going out.

January 1 *and* 2, 1877.—Heavy rain fell, flooding many places, and a heavy sea is reported outside. Two of the crew of the United States revenue cutter Moccasin were drowned while attempting to rescue crew of the British bark Disco.

January 8 *and* 9, 1877.—Several vessels remained in port on account of the display.

March 8 *and* 9, 1877.—A ferry-steamer on the Ashley River was damaged; also, trees were blown down.

April 8 *and* 9, 1877.—Many seamen visited the office and no vessels left port. Thunder and violent rain accompanied the gale.

April 12 *to* 14, 1877.—The city suffered greatly from the high tide produced by the heavy northeast gale. Injury to shipping comparatively small; much damage to small crafts. Damage to vessels, wharves, and through the city estimated between $60,000 and $100,000. The loss to plantations along coast and rivers, by wind and inundation, said to be great.

The press give the reports as liberal space as circumstances allow. Weekly and

monthly extracts are published regularly, as also items from the daily bulletin and Weekly Weather Chronicle. From the latter are published the condition of the rivers and the weekly rain-fall for the different districts, thus giving much valuable information to the great mass of the people, by many of whom such reports are eagerly sought. In addition to the benefits derived from the reports and the distribution of much valuable information, the office is found to be useful to both citizens and seamen for the purpose of serving as a standard for the comparison and correction of instruments. The people generally take much interest in the weather reports.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	6,538
Number of Local Reports issued during the year ending June 30, 1877	489
Number of Form 15 (manifold) issued during the year ending June 30, 1877	1,560
Number of Form 22 issued during the year ending June 30, 1877	44
Total	8,631

CHEYENNE, WYOMING TERRITORY.

[*Official number*, 68.]

Latitude	41° 12′
Longitude	104° 42′
Mean barometer for the year ending June 30, 1877	29.940
Mean temperature for the year ending June 30, 1877	45°.0
Amount of rain-fall for the year ending June 30, 1877	7.52 inches.

No change has been made in the location of office since last report. Sergeant A. C. Dobbins remains in charge of the station.

PUBLICATIONS.

Number of bulletins (manifold) issued during the year ending June 30, 1877	1,887
Number of Form 22 issued during the year ending June 30, 1877	21
Total	1,908

CHICAGO, ILLINOIS.

[*Official number*, 37.]

Latitude	41° 52′
Longitude	87° 35′
Mean barometer for the year ending June 30, 1877	29.990
Mean temperature for the year ending June 30, 1877	47°.8
Amount of rain-fall for the year ending June 30, 1877	33.05 inches.

Sergeant C. E. Brinsmade remains in charge of the station, and has given satisfaction. One assistant was relieved July 27, a reduction in the working force of the larger stations having been rendered necessary on account of the general reduction in the service. Private G. H. Baker was discharged June 30, 1877. A civilian printer is employed at this station.

No change has been made in the location of the office or position of instruments since the date of last report. The location of the large signal-lantern was changed from the Central Hotel building to the Exposition building on March 28, in accordance with instructions received from the office of the Chief Signal-Officer, and signals have been displayed from that point since that date.

The following extracts are taken from the semi-annual report of the sergeant:

The practical closing of navigation occurred December 1, 1876, the insurance companies declining to take risks after this date.

The opening of navigation occurred on the 20th of April, the propeller Concord forcing her way through the ice in the Straits of Macinac on that date.

The propellers St. Lawrence and Albans arrived at this port on the 26th of the same month, being the first boats from the Lower Lakes this season, but sailing-vessels were detained at the Straits for several weeks after that date, on account of the ice-blockade, which lasted unusually long this spring. This office has been frequently called upon during the past six months for back data and other meteorological statistics. The interest of the public in the service still continues, and nearly all classes receive some benefit from the same, the most noted of which are the grain and produce dealers and shippers. Shippers of fruit and other articles liable to be injured by a sudden change of temperature give frequent calls to this office for information.

The lighting of the street-lamps in accordance with the weather reports, referred to in last report, has been continued through the past six months, and has proved to be a decided success, and also the means of saving a large amount of money for the city.

The mailing to the various post-offices of the Farmers' Bulletin has been continued without interruption. The number of officers now on the list and supplied with the Bulletin is 648. The various post-office officials continue to do all in their power to facilitate the prompt transmission of these reports.

Thirty-six cautionary signals have been displayed, of which number eleven are reported as justified, and twenty-five as not justified at the station.

The following notes relative to the display of these signals is taken from the abstract of Monthly Journal:

September 5 *and* 6, 1876.—Several vessels have arrived in a damaged condition, and report a severe southeast gale. The schooner Dolphin was driven ashore at Racine, and is a total wreck.

October 5 *to* 7, 1876.—Numerous minor disasters have been reported.

November 5 *to* 7, 1876.—But few vessels left port during the display, and several arrived in a damaged condition. The schooner Kate Howard was beached at Saint Joseph, Mich., in endeavoring to make that port.

November 30 *and December* 1, 1876.—Very rough on the lake; vessels coming in are covered with ice. Two or three vessels left harbor, but were compelled to return.

December 8 *and* 9, 1876.—The storm was very severe on the lake; there being several vessels due at this port, fears are entertained for their safety. No vessels left port, as the river being frozen over prevents either entrance or exit.

December 12 *and* 13, 1876.—Navigation closed for the winter.

April 19 *and* 20, 1877.—On the lake, severe wind, heavy sea, and dense fog. But one sailing-vessel left port: several ventured out, but returned again. Schooner Mary lost a portion of her deck-load; also schooner Fairy. Schooner Albatross shifted her deck-load and became water-logged, but reached port.

May 20 *to* 23, 1877.—Number of vessels arrived in a slightly damaged condition. The scow schooner Chapin, which had been leaking, shipped several heavy seas and sank as she reached the North Pier, near mouth of river.

June 25, 1877.—A severe storm, lasting about fifteen minutes, doing considerable damage to trees, windows, vessels in harbor, &c.

June 29 *to July* 1, 1877.—No casualties in vicinity. A tornado passed over central Indiana and Ohio on the night of the 30th ultimo, causing great loss of life and property.

The station was inspected in October, 1876, and was found in good condition.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1877	206,730
Number of Bulletins (manifold) issued during the year ending June 30, 1877	9,092
Number of Local Reports issued during the year ending June 30, 1877	1,921
Number of Form 22 issued during the year ending June 30, 1877	132
Total	217,875

CAPE HATTERAS, NORTH CAROLINA.

[*Official number*, 123.]

Latitude	35°14′
Longitude	75° 30′
Mean barometer for the year ending June 30, 1877	29.976
Mean temperature for the year ending June 30, 1877	59°.8
Amount of rain-fall for the year ending June 30, 1877	89.44 inches.

Sergeant G. Onslow was transferred, April 3, 1877, to office of Chief Signal Officer, and relieved by Sergeant H. Frey, who remains in charge.

One assistant was transferred to another station. An assistant is on duty as repair-man. The repair-section is the same as at last report. In the severe storm of September 15, 1876, the width of Oregon Inlet was increased, and the cable at that point was washed away. While awaiting the arrival of a new cable, signal stations were established and communication kept up by means of flag and torch signals, from January 1, 1877, to April 8. The line between Cape Henry and Kitty-hawk, N. C., was prostrated, several hundred poles and miles of wire being washed away. At this date a working party, under command of Lieutenant Tingle, is repairing the line, and every effort is being made to render communication with this important point secure from interruption. No change has been made in location of office since last report. The office was not formally inspected during the year.

Twenty-nine cautionary signals were displayed at this station, of which number twenty-two were reported justified and seven not justified at the station. The following extracts are made from the semi-annual reports of the sergeant:

It is impossible to ascertain of any direct benefits derived from the display of cautionary signals, for when observed vessels are always outside. The damages which are known to have resulted from these storms are as follows: Schooner Ann J. Laughlin sunk at Hatteras Inlet, March 16, 1877. Capt. Henry Waker made use of the United States coast line to inform the owners and insurance company of the disaster, and to get instructions, which were promptly received and the vessel saved. The schooner A. J. Bently put in to Hatteras Inlet in a leaking condition and with a sick crew, March 30, 1877. Capt. H. S. Williams, through the United States coast line, was enabled to adjust all his business with the owners, and again get under way.

CAPE LOOKOUT, NORTH CAROLINA.

[*Official number*, 136.]

Latitude	34° 36′
Longitude	76° 36′
Mean barometer for the year ending June 30, 1877	†30.057
Mean temperature for the year ending June 30, 1877	†55° .0
Amount of rain-fall for the year ending June 30, 1877	*70.94 inches.

Sergeant E. F. Brady was transferred June 30, 1877, to Keokuk, Iowa. Sergeant P. Belville was placed in charge June 30, 1877. Private T. Jones, the repair-man at this station, was detailed on temporary duty, with repair-party under First Lieut. C. A. Booth, since January 17, 1877.

The sea-coast telegraph-line was in good working order to Cape Lookout until September 15, 1876, since which date no direct telegraphic communication has been had with the office of the Chief Signal-Officer. The meteorological observations have been continued and forwarded, by mail, to the office of the Chief Signal-Officer. The office has not been regularly inspected during the year.

CINCINNATI, OHIO.

[*Official number* 65.]

Latitude	39° 6′
Longitude	84° 26′
Mean barometer for the year ending June 30, 1877	†29.978
Mean temperature for the year ending June 30, 1877	†54°.2
Amount of rain-fall during the year ending June 30, 1877	41.75 inches

Sergeant S. S. Bassler remains in charge of this station, and has performed all duties to the satisfaction of this office. His standing in the

* Record of eleven months only. All the thermometers at station having been broken by the storm of September, 1876, the continuous record for that month was lost.

† Mean of 30 days only in May, 1877.

community is excellent, as is shown by his having been elected curator of meteorology in the Society of Natural History, and invited by the directors of the Cincinnati University to give instructions in meteorology as part of the regular course of instruction in that institution.

Private J. B. Pleasants was relieved July 27, 1876, owing to reduction of force.

Private R. R. Herman was promoted to corporal, and transferred May 21, 1877, to Visalia, Cal.

One assistant was discharged from the service for drunkenness and neglect of duty. There are three assistants and a civilian printer on duty at this station. No change has been made in location of office or instruments since last report. The local interest in the service continues. The press devotes liberal space to the meteorological reports, and frequent favorable comments are made.

The following extracts are made from the semi-annual report of the sergeant:

The office is frequently visited and the records consulted. Subpœnas to produce the records in court as evidence are not unfrequent, and verdicts have, in several instances, been rendered in accordance with the evidence furnished by our records. The press is growing more and more favorable, and is in no way niggardly in giving space, and in some cases incurring considerable expense in the publication of weather reports.

The public interest finds expression in the remarks of Col. S. D. Maxwell, the efficient superintendent of the Merchants' Exchange, in his recent annual report of the Cincinnati Chamber of Commerce, which I take leave to quote: "It should be observed that the work of the Signal Service, on account of a reduction in the appropriation made by Congress, has not been as complete as the demand of commerce warrants. Each year demonstrates more clearly the value of the work of the Signal Service. What it may yet accomplish for commerce and agriculture and navigation, as its observations reach through larger periods, and its facts for deduction accumulate, may ultimately be as astounding as the present daily probabilities of the weather are accurate and valuable. Such a work, combining science with the most practical walks of life, appeals to the government for generous support at all times."

High water in the Ohio, 53 feet 8 inches, occurred January 20, 1877, and low water, 6 feet 3 inches, September 4, 1876.

This station was inspected in February, 1877, and found in excellent condition. Five hundred and fifty-seven post-offices have been supplied with the Farmers' Bulletin from this station.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1877	166,206
Number of Bulletins (manifold) issued during the year ending June 30, 1877	6,831
Number of Local Reports issued during the year ending June 30, 1877	1,039
Number of Form 15 (manifold) issued during the year ending June 30, 1877	1,258
Number of Form 22 issued during the year ending June 30, 1877	153
Number of Form 26 issued during the year ending June 30, 1877	2,793
Total	178,280

CLEVELAND, OHIO.

[*Official number*, 34.]

Latitude	41° 30′
Longitude	81° 47′
Mean barometer for the year ending June 30, 1877	30.016
Mean temperature for the year ending June 30, 1877	47°.4
Amount of rain-fall for the year ending June 30, 1877	38.07 inches.

Sergeant Will Stromberger was relieved September 8, 1876, for misconduct. Sergeant George Prender was assigned September 8, 1876, and

remains in charge. Sergeant L. M. Dey was temporarily assigned May 14, 1877, during illness of Sergeant Prender and his assistant, Private Hancock. Sergeant Prender was taken seriously ill on May 14, 1877, and was unfit for duty until June 9, 1877. Private Hancock was taken sick May 9, 1877, and removed to hospital May 26, 1877. Mr. J. E. King performed station duties during illness of Sergeant Prender and Private Hancock, until the arrival of Sergeant Dey. No changes have been made in location of office during the year. The station was inspected in October, 1876, and found in fair condition. Thirty-three cautionary signals were displayed at this station during the year, of which number twenty-one are reported as justified, and twelve not justified. In reference to some of these displays, the sergeant remarks as follows:

October 5 *to* 7, 1876.—Signal generally heeded, and everywhere appreciated. Unusually heavy sea.

November 22, 1876.—Owners and masters called at the office and decided to remain in port.

November 27 *and* 28, 1876.—Seamen visiting the office state that a high and dangerous wind was encountered on the lake.

November 30 *to December* 2, 1876.—A heavy snow-storm prevailed on the lake. No vessels left port after signal was hoisted. An unknown schooner was sunk fourteen or fifteen miles north of Cleveland. The display gave much satisfaction. The unknown schooner reported lost was the S. F. Gale. All hands are supposed to have been lost. The schooner W. B. Ogden, after battling with heavy gales for three days, was only saved from being lost by the revenue steamer Perry coming to her rescue.

December 8 *to* 10, 1876.—The most severe storm of the season. Light snow fell, and many persons were frozen. A number of vessels parted their ropes and chains. The signal was heeded without exception. Many persons called at the office for information that had friends on the lake. The weather was intensely cold.

December 13, 1876.—No vessels left port; one attempted to leave but was forced to return.

December 14 *to* 15, 1876.—A very severe storm; the caution had good effect. The press commented favorably on the display.

December 15 *to* 16, 1876.—No marine disasters have been reported, but much damage was done in the city. The signal was heeded by those interested.

December 17 *and* 18, 1876.—Light snow fell, and the broken shore-ice became a solid mass, closing navigation.

March 31 *to April* 2, 1877.—Rain and threatening weather, first notable lightning this season. A schooner attempted to go out and was driven back by the ice. Navigation still closed.

April 27 *to* 29, 1877.—A severe squall, accompanied by heavy rain and large hailstones. A number of vessels were more or less damaged.

June 9 *and* 10, 1877.—No vessels are reported to have left port. Owners visiting the office acknowledged the service rendered.

June 25, 1877.—The damage in the city was not remarkable, but in the country very severe.

June 30, *July* 1, 1877.—No lake disasters reported; owners and masters being governed by the official warning; several visited the office.

The following extracts are made from the semi-annual reports of the sergeant:

Ice on the lake broke up for the last time on March 31, and at 7.40 p. m. of that day the first cautionary signal of the season was hoisted.

Navigation was not fully resumed until the middle of April, but on the 10th of that month the steamer Northwest, of the Cleveland and Detroit line, the first arrival, made port with great difficulty, and a lighter vessel would have been unable to plow through the ice.

The highest wind recorded (forty and forty-eight miles per hour) occurred on April 27 and June 30, respectively, both of which were anticipated by the central office and timely warning of their approach given through the storm-signal.

Complaint was made on one occasion that the signal displayed on this building could not be seen from some anchorages in the harbor, and the injuries then sustained by one of the vessels (the schooner Trade Wind) were attributed to this defect. With this single exception the several displays satisfied all concerned and doubtless saved many lives and much property. As hitherto, the people representing both capital and labor, engaged in lake trade and navigation, lend their full support to the service, and take frequent occasion to testify its usefulness.

As already intimated, the medical profession continue to receive valuable information from the office, and a report, prepared weekly, forms a part of the health officer's official bulletin.

Since my last report was rendered I have, through subpœnas, been required on three occasions to appear in the courts of law as a witness, with certain portions of the official record.

As heretofore the press sustains the service in each and every particular.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	7,987
Number of Local Reports issued during the year ending June 30, 1877	1,420
Number of Form 15 (manifold) issued during the year ending June 30, 1877	6,542
Number of Form 22 issued during the year ending June 30, 1877	108
Total	16,057

COLORADO SPRINGS, COLORADO.

[*Official number*, 109.]

Latitude	38° 55′
Longitude	104° 58′

The station was discontinued July 31, 1876, as an observing and reporting station, but was continued as a supply station to Pike's Peak.

Sergeant C. M. Hobbs remains in charge of station June 30, 1877, his relief, Sergeant Black, not having arrived at the station. Private R. Strain was relieved July 24, 1876, owing to reduction of force. Private J. T. O'Keeffe was relieved October 10, 1876, for promotion. Private J. L. Barret was assigned October 11, 1876.

CORSICANA, TEXAS.

[*Official number*, 107.]

Latitude	32° 5′
Longitude	96° 30′
Mean barometer for the year ending June 30, 1877	30.025
Mean temperature for the year ending June 30, 1877	64°.0
Amount of rain-fall for the year ending June 30, 1877	41.40 inches.

Sergeant J. W. Smith has remained in charge during the year, and has performed his duties faithfully.

The interest manifested by the citizens is steadily increasing, the office being often visited by persons for information concerning the weather.

The office was moved July 29, 1876, to another room on same floor of the building occupied as an office. No change was made in elevation of instruments.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1877	312
Number of Form 22 issued during the year ending June 30, 1877	44
Total	356

DAVENPORT, IOWA.

[*Official number*, 51.]

Latitude	41° 32′
Longitude	90° 38′
Mean barometer for the year ending June 30, 1877	30.027
Mean temperature for the year ending June 30, 1877	48°.1
Amount of rain-fall for the year ending June 30, 1877	36.32 inches.

Sergeant R. R. Martin remains in charge of the station, and has faithfully performed his duties. Private B. E. Light was relieved July 24,

1876, no assistant replacing him. The station was inspected in October, 1876, and found in excellent order. There has been no change in the location of the office or instruments since last report. The following extracts are made from the semi-annual reports of the sergeant:

The river remained frozen from January 1 to February 21, when the ice gave way, and floating ice continued to obstruct navigation until March 10, when the river was again frozen, and remained in that condition until March 18, when it again opened. Navigation opened March 30, twenty-three days later than last year.

Highest stage of water during year July 8, 10 feet 5 inches. Lowest stage of water. during year March 8, 2 feet 2 inches.

The public interest in the service and reports continues unabated.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	6,015
Number of Form 22 issued during the year ending June 30, 1877	55
Number of Form 26 issued during the year ending June 30, 1877	366
Total	6,436

DENVER, COLORADO.

[*Official number*, 76.]

Latitude	39° 45′
Longitude	105° 4′
Mean barometer for the year ending June 30, 1877	29.992
Mean temperature for the year ending June 30, 1877	49°.3
Amount of rain-fall for the year ending June 30, 1877	17.81 inches.

No change has been made in the working force during the year, nor in location of office. Sergeant Barwick remains in charge, and has given satisfaction. The station was inspected in December, 1876, and was found in good condition.

The inspector reports that at no place has he found an interest in the weather reports equal to that taken by the residents of Denver.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	1,248
Number of Form 22 issued during the year ending June 30, 1877	83
Total	1,331

DETROIT, MICHIGAN.

[*Official number*, 36.]

Latitude	41° 21′
Longitude	83° 7′
Mean barometer for the year ending June 30, 1877	29.985
Mean temperature for the year ending June 30, 1877	46°.5
Amount of rain-fall for the year ending June 30, 1877	34.05 inches.

Sergeant T. V. Van Heusen still remains in charge of the station and has been faithful in the performance of his duties. One assistant was relieved for promotion and two were transferred to other stations. The present force consists of one sergeant, one assistant, and a civilian printer.

There have been no changes made in the location of office or instruments since last report. The station was inspected in January, 1877, and found in good condition.

Twenty-seven cautionary signals were displayed during the year, of which number ten are reported as justified and seventeen not justified.

The sergeant makes the following remarks in relation to some of these displays:

July 5, 1876.—Much damage was occasioned throughout the city; trees were broken and uprooted; signs and awnings carried away; unfinished buildings badly shaken; wagons and carriages overturned; in some instances pedestrians were injured by being thrown against buildings; telegraph lines were prostrated in many sections; the river was very rough; small vessels dragged their anchors and collided; ferry-boats were compelled to suspend their trips and vessels to seek harbor; minor disasters among the shipping were numerous; no lives are known to be lost.

September 28 *and* 29, 1876.—Rough weather is reported on Lake Erie. The steamer Jay Cooke abandoned regular daily trips, and remained in harbor.

October 9 *and* 10, 1876.—No serious damage. The office was visited by many mariners, vessel-owners, and other interested parties. Without one exception, all expressed great friendliness toward the service, and the utmost confidence in the accuracy and value of its predictions and reports. The interest in the service yearly increases.

November 2 *and* 3, 1876.—The timely warning elicited much favorable comment from those connected with the shipping interest in the city.

December 15 *and* 16, 1876.—The storm was one of the most severe ever experienced in this section. Much local damage was occasioned by the severity of the wind. In one instance the entire side of a brick house was blown in, buildings were unroofed, chimneys blown down, &c. The ferry-boats made their trips with the greatest difficulty; the ice was piled up in immense masses in front of the city. No marine disasters occurred, as no vessels went out on the lake. The display was very favorably and freely commented upon by the people.

March 31 *to April* 2, 1877.—Navigation not yet opened. Much damage was done throughout the city by the wind, and although many accidents were reported no lives are known to have been lost. Rain with violent thunder accompanied the gale; hail fell; some of the stones were a quarter of an inch in diameter. The severity of the storm attracted much attention to the signal, and its complete justification and timely warning has added much to the confidence reposed in the displays.

May 20 *to* 23, 1877.—On Lakes Erie and Huron the wind is reported to have been very severe. No disasters reported other than destruction of sails, rigging, &c.

June 9 *and* 10, 1877.—A severe storm prevailed on Lakes Erie and Huron; several vessels lost portions of their masts and rigging.

June 30 *to July* 1, 1877.—No marine disasters. Considerable local damage.

The steamer Northwest left for Cleveland April 10, 1877, being the first boat leaving port this season. She arrived from Cleveland April 12, 1877, being the first arrival of the season.

The following extracts are made from the semi-annual reports of the sergeant:

The large weather map, hung in the rooms of the Board of Trade, has been changed daily (Sundays and holidays excepted), and has been made much use of by the members of the board. The grain, commission, and produce merchants connected with the board make a daily study of the map, and, in a great measure, control their business in accordance with the nature of the prevailing and impending weather. The board, as a whole, is very friendly to the Signal Service.

The friendliness to the service which has ever characterized the members of the press of Detroit remains unabated.

Messrs. J. P. Donaldson & Co. have continued to duplicate day and night signals, and Messrs. M. S. Smith and Co. to duplicate day signals, in each case satisfactorily.

Whenever the cautionary signal has been hoisted this year, the unusual interest manifested in the reports that are posted in the more conspicuous places has been very noticeable. At such times the office has been visited by many vessel-owners anxious to learn all the particulars of the expected or then prevailing storm.

In all the conversations held with vessel-owners and captains, I have never heard a remark made, in reference to the cautionary signal, that was not highly flattering to the service.

The information had from outlying towns, though very meager, is highly favorable to the efficiency of the Farmers' Bulletins, as a means of imparting desired and appreciated intelligence of the weather to the farming classes.

In recalling the experiences of the past six months, it is pleasing to note that, among the trades and professions, the value of the reports of the service is becoming better known and appreciated. This is evinced by the increase in the number of callers at the office, and the words of praise and encouragement which they invariably have to bestow.

In addition, by arrangements *lately* made with the city inspector of gas, that official

is informed daily, at 6 p. m., in regard to the probable condition of the sky during the night, and from this information issues orders in regard to the lighting of the street lamps, whereby a large sum of money is saved the city.

Three hundred and thirty-five post-offices have been regularly supplied with Farmers' Bulletins.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1877	109,945
Number of Bulletins (manifold) issued during the year ending June 30, 1877	7,672
Number of Local Reports issued during the year ending June 30, 1877	1,046
Number of Form 22 issued during the year ending June 30, 1877	110
Total	118,773

DODGE CITY, KANSAS.

[*Official number*, 106.]

Latitude	37° 39′
Longitude	100° 8′
Mean barometer for the year ending June 30, 1877	29.652
Mean temperature for the year ending June 30, 1877	52°.0
Amount of rain-fall for the year ending June 30, 1877	21.17 inches.

Sergeant J. J. Weinberg was relieved August 9, 1876, and ordered to Fort Whipple, Virginia, for additional instructions, and Sergeant E. Garland was assigned to the station.

No change was made in location of office or instruments during the year. The station was inspected in March, 1877, and found in a satisfactory condition.

A number of papers in adjacent towns publish weekly and monthly reports received from the sergeant.

DUBUQUE, IOWA.

[*Official number*, 98.]

Latitude	42° 30′
Longitude	90° 44′
Mean barometer for the year ending June 30, 1877	30.002
Mean temperature for the year ending June 30, 1877	47°.1
Amount of rain-fall for the year ending June 30, 1877	44.16 inches.

Sergeant D. M. Kennedy continues in charge of the station, and performs all the duties satisfactorily without assistance. High water occurred July 5, 1877, when it was 12 feet 2 inches, and low water March 10, when it was 1 foot 6 inches.

The sergeant reports that interest in the service is steadily on the increase, both as to meteorological and river reports. The station was inspected in October, 1876, and Sergeant Kennedy was highly complimented by the inspector for his attention to duty, and the care taken of the public property in his care.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	2,941
Number of Local Reports issued during the year ending June 30, 1877	1,050
Number of Form 22 issued during the year ending June 30, 1877	44
Number of Form 26 issued during the year ending June 30, 1877	2,941
Total	6,976

DULUTH, MINNESOTA.

[*Official number*, 40.]

Latitude	46° 48′
Longitude	92° 8′
Mean barometer for the year ending June 30, 1877	29.982
Mean temperature for the year ending June 30, 1877	40°.36
Amount of rain-fall for the year ending June 30, 1877	33.64 inches.

Sergeant T. S. Collins continues in charge of the station. No change has been made in position of office or instruments during the year. Navigation opened April 5, 1877.

The sergeant reports that there has been a marked increase in the interest manifested in the service.

Thirty cautionary signals were displayed during the year, and of this number twelve are reported as justified and eighteen not justified. The sergeant makes the following remarks in relation to some of these displays:

October 5 *and* 6, 1876.—Steamer Quebec remained in port. No damages reported. A timely warning.

December 1, 1876.—The last boat for this port arrived to-day.

December 12 *and* 13, 1876.—Navigation closed.

April 27 to 29, 1877.—Steamer Manistee remained in port. No damage reported.

May 5 *and* 6, 1877.—Steamer Manistee, the first arrival this season from Portage and Prince Arthur's Landing.

May 20 *to* 22, 1877.—Steamer Cumberland left before the signal was hoisted. Steamer Asia left port, but soon returned. Steam-barge Townsend, having in tow schooner Edward Kelly, lost her rudder and shoe; the schooner parted her tow-line and lost her mainsail.

EASTPORT, MAINE.

[*Official number*, 94.]

Latitude	44° 55′
Longitude	66° 54′
Mean barometer for the year ending June 30, 1877	29.912
Mean temperature for the year ending June 30, 1877	41°.9
Amount of rain-fall for the year ending June 30, 1877	53.20 inches.

Sergeant T. A. Taylor was ordered to office of Chief Signal-Officer for discharge December 21, 1876; was re-enlisted, promoted to be sergeant, and reassigned January 13, 1877. One assistant was relieved August 22, 1876, for drunkenness, and one for insubordination. Private G. V. Russell was assigned to station June 22, 1877.

Sergeant T. A. Taylor was taken sick and was unfit for duty from June 11 to 21, 1877, during which period Mr. Aaron H. Bell performed station duties. The station was inspected in July, 1876, and May, 1877, and found in good condition.

No change has been made in the location of the station or the elevation of any instrument since last report.

The classes of citizens deriving the greatest benefit are sea-faring men, captains of fishing-vessels, and steamers; also small coasters who sail from this port.

Fifty-three cautionary signals were displayed, of which number thirty-five are reported justified and eighteen not justified.

The sergeant remarks as follows in reference to some of these displays:

July 6, 1876.—All vessels remained in port.

September 27, 1876.—No vessels in port. The steamer City of Portland reports very heavy south and southwest winds coming from St. John's to-day.

October 14 to 16, 1876.—Four fishing-vessels went ashore at Grand Manan. Great preparations were made in the harbor by owners of vessels for the gale, and all vessels left the wharves and sought a safe anchorage.

December 9 *and* 10, 1876.—Gale, accompanied by snow; all vessels remained in port.

December 16 *and* 17, 1876.—All vessels remained in port. A number of marine disasters occurred along the coast, but so far no loss of life is reported.

December 18 *and* 19, 1876.—All vessels remained in port, including four steamers. The weather extremely cold and accompanied by snow. Barns and sheds were demolished at this place. Several vessels along the coast were dismantled, others lost sails and a portion of rigging, and two or three are reported ashore. Steamer Artisan had to throw overboard a portion of her cargo, among which was $6,000 to $7,000 worth of leather.

December 29 *to* 31, 1876.—Considerable damage was done by the gale; numerous fences and chimneys blown down; windows broken. A schooner was badly damaged by striking against the wharf. Revenue-cutter lost her fenders by friction against the wharf.

January 1 *to* 3, 1877.—Light snow accompanied the gale. All vessels remained in port.

February 12 *to* 14, 1877.—All vessels remained in port. The gale was accompanied by heavy snow, which delayed the arrival of trains, steamboats, &c.

February 17 *and* 18, 1877.—All vessels remained in port. A schooner at Lubec lost her topmast. The thick snow which prevailed rendered navigation dangerous.

February 24 *to* 26, 1877.—All vessels remained in port. The revenue-cutter reports having assisted two vessels on the coast which had received injury from the gale.

March 2 *and* 3, 1877.—No damage to shipping in the harbor. Wharves were badly ripped up by the wind and high tide; chimneys, signs, &c., were blown down.

March 14, 1877.—The only vessel in port was a steamer of the International Line, which delayed sailing.

March 16 *to* 19, 1877.—The gale was accompanied by the heaviest snow-storm known for years, the fall being nearly two feet on the level and in drifts from five to fifteen feet deep. Travel of all kinds and outdoor work was interrupted. No marine disasters reported.

March 25 *to* 29, 1877.—All vessels remained in port. Gale, accompanied with rain and thick fog, which rendered navigation dangerous on the coast. The storm to the west of here was very severe.

April 19 *to* 21, 1877.—All vessels remained in port.

The following extracts are made from the semi-annual report of the sergeant:

"An increase of interest is manifested daily by all classes of citizens at this place, and the reports and display of warnings have been generally regarded to a much greater extent than usual."

"The owners and captains of vessels, sail and steam, by the display of the cautionary signals, are saved damage from gales, &c. The steamers of the International Line also derive great benefit, and but few instances are recorded when steamers of this line leave port while the flags or signal-lights are flying. Captains Winchester, Pike, Hall, and Long, of the International Steamship Company, have frequently stated to me that they found the signals of great value."

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	3,927
Number of Form 22 issued during the year ending June 30, 1877	27
Total	3,954

ESCANABA, MICHIGAN.

[*Official number*, 49.]

Latitude	45° 46′
Longitude	87° 14′
Mean barometer for the year ending June 30, 1877	29.981
Mean temperature for the year ending June 30, 1877	40°.2
Amount of rain-fall during the year ending June 30, 1877	26.99 inches.

Sergeant S. W. Naylor was relieved November 28, 1876, for neglect of duty. Sergeant M. J. Shanefelter was assigned November 28, 1876; transferred February 6, 1877, to Punta Rassa, Fla. Private James Gilligan was relieved July 24, 1876, for promotion. Promoted to sergeant, and assigned to duty at Escanaba, February 6, 1877. No change has

been made in the location of office or instruments since last report. The station was inspected in September, 1876, and found in a satisfactory condition. The harbor closed with ice nights of 9th and 10th of December, 1876. Last shipment of iron ore by vessel was made November 25, 1876. Navigation opened at Escanaba on the 18th of April, 1877. Steam-barge Ira H. Owen and her consort, the schooner Jessie Linn, arrived at 4 a. m., April 25, 1877, being the first arrival of the season.

Thirty-two cautionary signals were displayed during the year, of which number seventeen are reported justified, and fifteen not justified. The sergeant makes the following remarks relative to some of these displays:

July 6 *and* 7, 1876.—No vessels left during the display.
September 9 to 11, 1876.—Blew a gale on the lake. No vessels left.
October 5 to 7, 1876.—One large schooner arrived leaking badly.
October 20 and 21, 1876.—General attention paid to signal. No vessels left port.
April 19 and 20, 1877.—No vessels in harbor. Storm carried ice out of bay. Navigation now opened.
May 29 *to June* 2, 1877.—The schooner Eliza Gurlock and schooner C. G. Breed remained in port. Captain Wallace, of schooner Thomas Gawin, arrived June 1; reports having lost three top-sails. Captain Harburage, schooner Senator, arrived on 1st instant; reports heavy sea and high winds on the lake.
June 30, 1877.—Trees were blown down, and the telegraph-line broken in several places between here and Green Bay.

The following extracts are made from the semi-annual reports of the sergeant:

The masters of vessels take great interest in the service, and most of them visit this office every time they come to the port, and when the cautionary signal is displayed they often stay in this office until midnight to see if I get any orders from the chief office. They all say that they could not get along without the Signal Service, and speak very highly of the benefits derived from it. The managers of railroads and employés, and the greater part of the citizens of the town, take a lively interest in the service.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1877	52
Number of Form 22 issued during the year ending June 30, 1877	11
Total	63

ERIE, PENNSYLVANIA.

[*Official number*, 97.]

Latitude	42° 7′
Longitude	80° 10′
Mean barometer for the year ending June 30, 1877	29.978
Mean temperature for the year ending June 30, 1877	47° .8
Amount of rain-fall for the year ending June 30, 1877	36.67 inches.

Sergeant E. F. McComas was relieved April 12, 1877, for discharge, and Sergeant W. A. Chapman assigned to this station. The station was inspected in January, 1877, and found in a satisfactory condition. No change has been made in location of station or instruments during the year.

Thirty-two cautionary signals were displayed during the year, of which number twenty-one are reported justified, and eleven not justified. The sergeant makes the following remarks in relation to some of these displays:

July 2, 1876.—A severe squall. A sail-boat capsized on the bay, with two ladies and three gentlemen on board. One of the ladies was drowned.
July 5, 1876.—Two large ice-houses, belonging to Clark & Carey, were completely wrecked.

July 20, 1876.—A squall. No serious damage done. Lumber-piles blown down; vessels broke from their moorings, and tug Hercules lost her smoke-stack. The squall lasted about fifteen minutes, accompanied by rain, thunder, and lightning.

September 17 *and* 18, 1876.—Several fish-boats lost; five men and one boy lost. No other damage heard of.

September 26 *and* 27, 1876.—Only one vessel left port, an Anchor Line propeller. Five captains called at the office.

October 9 *and* 10, 1876.—No vessels left port. Several captains called at the office for information, and expressed their admiration of the service.

October 20 and 21, 1876.—Several captains called at the office. No vessels left.

November 2 *and* 3, 1876.—The schooner Bacon left; her captain reports that he was compelled to return. No other vessel attempted to leave; several sought shelter here.

November 6 *and* 7, 1876.—But one vessel attempted to leave, the propeller Idaho, but was compelled to return.

November 22, 1876.—Vessels remained in port. A number of captains called at the office.

December 29 *and* 30, 1876.—Gale, accompanied by heavy snow, which effectually blockaded all the railroads leading into the city.

April 19 *and* 20, 1877.—Hail-storm for a few minutes, stones size of small marbles, accompanied with lightning, which struck a small sail-boat in the bay, badly damaging it and stunning two men in it.

The following extracts are made from the semi-annual reports of the sergeant:

The interest in the service has increased rather than diminished, and as people become better acquainted with its practical utility they make more and more use of it. I have been summoned to appear in court and testify with regard to the weather on certain dates, and I have also furnished statements to be used in evidence in cases before courts. Builders and contractors on outdoor work use the reports, and are frequent callers at the office. Farmers, with whom I have conversed, express great interest in, and satisfaction with, the Farmers' Bulletin and the "Indications" as published in the daily papers. During the season of navigation, as heretofore, this office has been frequented by vessel-owners and captains, and the strictest attention has been paid to the display of cautionary signals; and even when cautionary signals were not displayed, it has become almost a custom for captains to visit this office for the latest information before leaving port. With regard to cautionary signals during the last six months, they have been highly praised by every one, and the captain who leaves port when the flag is flying is generally considered imprudent, not to say reckless, and I do not know of a single instance in the past six months where a sailing-vessel has left during a display, and it is an exceptional thing for a propeller to do.

Navigation at this port closed on the 2d of December with the arrival of the schooner Wm. B. Ogden, towed in in a disabled condition by United States revenue-cutter Perry; the last clearance being schooner D. Sharp, on the 1st. Harbor frozen over on the 8th, with ice extending far out into the lake.

Tug Mary A. Green started for Fairport, Ohio, to-day, April 21, 1877, being the first departure of the season.

Schooner E. R. Williams arrived from Toledo April 24. She encountered heavy ice, which carried away her bob-stays. First vessel of the season to arrive.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877..	6,269
Number of Local Reports issued during the year ending June 30, 1877.....	367
Number of Form 15 (manifold) issued during the year ending June 30, 1877 ..	3,640
Number of Form 22 issued during the year ending June 30, 1877	56
Total	10,332

EVANSTON, ILLINOIS.

[*Official number*, 132.]

Latitude	42° 2′
Longitude	87° 42′

Sergeant Wm. Finn, who was in charge of station at date of last report, was relieved from duty by orders, dated July 24, 1876, to take effect on the 31st, at which time the station was discontinued.

FORT GIBSON, INDIAN TERRITORY.

[*Official number*, 93.]

Latitude	35° 43′
Longitude	95° 16′
Mean barometer for the year ending June 30, 1877	29.990
Mean temperature for the year ending June 30, 1877	58°.0
Amount of rain-fall for the year ending June 30, 1877	37.98 inches.

The location of instruments and of station remains as at date of last report. Sergeant D. O'Leary was transferred September 18, 1876, to Fort Sully, Dakota Territory, and Sergeant George H. Crane was assigned to this station and remains in charge. The station was inspected in March, 1877, and found in a satisfactory condition.

The sergeant reports that all classes of citizens take an interest in the service, and are glad to receive such information as the limited facilities of this office will permit.

A local weekly report has been furnished the Indian Journal at Eufaula, Indian Ter. The interest taken by the citizens of this place is gradually increasing, and the fear and awe with which the natives have looked on this office is slowly wearing off, and they are beginning to understand for what purpose the office is placed in their midst.

FORT SULLY, DAKOTA TERRITORY.

[*Official number*, 83.]

Latitude	44° 39′
Longitude	100° 40
Mean barometer for the year ending June 30, 1877	*29.934
Mean temperature for the year ending June 30, 1877	*45°.9
Amount of rain-fall for the year ending June 30, 1877	*24.26 inches.

Mr. S. V. Clevenger, civilian, was relieved September 18, 1876. Sergeant D. O'Leary was assigned to the station.

No change has been made in location of office since last report. Owing to the condition of the telegraph line, which is nearly always out of order, the reports from this station are received very irregularly.

The station was inspected in October, 1876, and found in fair condition.

High water, 13 feet 11 inches, occurred June 9, 1877, and low water, 2 feet 8 inches, October 16, 1876.

The first boat arriving from up the river was the Fontenelle, which arrived April 6. The first one from below, the Carroll, arrived April 8, 1877.

GALVESTON, TEXAS.

[*Official number*, 55.]

Latitude	29° 18′
Longitude	94° 50′
Mean barometer for the year ending June 30, 1877	30.073
Mean temperature for the year ending June 30, 1877	68°.7
Amount of rain-fall for the year ending June 30, 1877	42.99 inches.

Sergeant C. A. Smith continues in charge at Galveston. An assistant was sent to this station May 17, 1877, in accordance with the recommendation of the inspecting officer. No change has been made in the location of office or instruments during the period covered by this report. The station was inspected in May, 1877, and found in a satisfactory condition.

* Ten months only. No observations made in October and November, 1876.

Fifty-two cautionary signals were displayed during the year, of which number twenty-eight are reported justified and twenty-four not justified. The sergeant makes the following remarks in reference to some of these displays:

November 22 *and* 23, 1876.—The schooner Silla Sama collided with the wharf, lost her bowsprit, and damaged her bulwarks.

December 31, 1876, *and January* 1, 1877.—The schooner Crinoline encountered the gale off Sabine Point on the 31st, losing foresail, mainsail, jib, and rudder. She was picked up by the United States revenue-cutter Seward, and towed into port.

January 7 *and* 8, 1877.—This was the most severe "norther" of the season.

March 23 *to* 25, 1877.—Vessels in port and in the offing had a rough time of it, but no disasters occurred.

April 12 *and* 13, 1877.—The steamer Hutchinson blown against the wharf. Not seriously damaged.

April 24, 1877.—This gale was a species of tornado, lasting, in its severity, but ten minutes. A number of buildings were unroofed, and some entirely demolished. Two schooners, loaded with lumber, were sunk, the crews escaping. A steamer and several small crafts were blown ashore, cars turned over on the track, awnings, signs, chimneys, and fences in the city were prostrated. No lives lost. Damages estimated from $25,000 to $50,000.

The following extracts are made from the semi-annual report of the sergeant:

Interest in the reports among the members of the Cotton Exchange continues unabated, and especially centers on the weather map, which is warmly commented upon.

The owners and masters of coasting-vessels, next to the members of the Cotton Exchange, take the most interest, and derive the greatest amount of benefit from the reports. During the winter season they call at this office in large numbers in quest of information about the northers. The reports from the military telegraph line enable them to judge quite accurately when to expect these storms, and they time and shape the direction of their trips accordingly.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877 ..	2,271
Number of Local Reports issued during the year ending June 30, 1877.....	210
Number of Form 22 issued during the year ending June 30, 1877.....	56
Total	2,537

GRAND HAVEN, MICHIGAN.

[*Official number*, 48.]

Latitude.....	43° 5′
Longitude.....	86° 18′
Mean barometer for the year ending June 30, 1877.....	29.984
Mean temperature for the year ending June 30, 1877.....	46°.6
Amount of rain-fall for the year ending June 30, 1877 .....35.80	inches.

No change in working force. Sergeant J. M. Frantz continues in charge of the station, and has given satisfaction by his strict and faithful performance of his duty. The station was inspected in January, 1877, and found in good condition. The following extracts are made from the semi-annual reports of the sergeant:

Navigation was practically closed on the 16th for all kinds of sailing-vessels. The boats that comprise the Detroit and Milwaukee line are all large steam-vessels, and have so far overcome all obstructions in the form of ice. The officers connected with this line take great interest in the service. All classes of citizens, and more particularly mariners, take a lively interest in everything pertaining to the service, and numerous inquiries are made and frequent visits to this office when the weather has a threatening appearance.

April 3, 1877.—Steamer Barret arrived from Grand Rapids, being the first arrival of the season. Reports river clear of ice.

Fifty-seven cautionary signals were displayed during the year, of which number forty-eight are reported justified and nine not justified.

The following remarks on the subject of cautionary signals are made by the sergeant:

September 3 *and* 4, 1876.—Several vessels put into port for safety. The masters report a very heavy sea.

September 28 *and* 29, 1876.—Several vessels put into port for safety, and report a very heavy sea.

October 1 *to* 4, 1876.—No vessels left port.

October 9 *and* 10, 1876.—The schooner Two Charlies went to pieces against the south pier. The schooners Minnie Carlette and H. D. Moore and barge Island Queen, all loaded with lumber, went on the beach near the north pier. Total loss estimated at $10,000.

October 20 *and* 21, 1876.—Several vessels put into port for shelter.

December 15 *and* 16, 1876.—Gale, accompanied with snow. Telegraph lines down. No serious disasters occurred. No marine disasters reported.

January 13 *and* 14, 1877.—River blockaded with ice and snow, causing delay in navigation. No disasters.

January 19 *to* 21, 1877.—Accompanied by light snow-squalls, changing to light rain at night. No vessels left port.

February 15 *to* 17, 1877.—The entrance to harbor was blocked with floating ice, impeding navigation.

March 6 *to* 11, 1877.—Wind and snow-storm. The harbor again blockaded with ice. The railroads leading into the city were blockaded with snow, delaying travel.

March 31 *to April* 2, 1877.—Rain and hail accompanied the gale. Some of the hail-stones were half an inch in diameter. No vessels left port.

May 20 *to* 23, 1877.—Heavy rain, with terrific thunder and lightning. On the 20th the lightning struck a barn in the city, burning it and killing a horse; also the Baird block was struck. Several vessels put into port for safety.

June 8 *to* 10, 1877.—Gale, accompanied by rain. Reports state that the heavy rains have put out the extensive forest fires that have been raging throughout the State.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1877	40
Number of Form 22 issued during the year ending June 30, 1877	24
Total	64

INDIANAPOLIS, INDIANA.

[*Official number*, 43.]

Latitude	39° 47′
Longitude	86° 6′
Mean barometer for the year ending June 30, 1877	30.009
Mean temperature for the year ending June 30, 1877	52°.0
Amount of rain-fall for the year ending June 30, 1877	44.18 inches.

No change has been made in working force since last report. Sergeant C. F. R. Wappenhans remains in charge of the station and has one assistant. The work of the station has been satisfactorily performed.

The office was inspected in January, 1877, and found in good order. The inspecting officer complimented Sergeant Wappenhans on his attention to duty and the management of his station. No change has been made in location of office or instruments during the year.

The following extracts are made from the semi-annual reports of the sergeant:

The temperature, wind, and weather of the A. M. bulletin was also furnished to the Western Union Telegraph Company, and lately also to the Atlantic and Pacific Telegraph Company. The Western Union Telegraph Company send this information with all commercial quotations and press reports to many places in Indiana and Ohio, and also over the gold and stock telegraph to many business houses in the city.

A report of all local observations of temperature, direction of wind, weather, and especially time and amount of rain, is daily furnished to the Empire Freight Line, and a copy of these is forwarded to the general superintendent at Terre Haute, Ind., and Cleveland, Ohio. Other freight-officers call frequently at this office to gather information of amount and time of rain-fall. The issue of local observations to the board of health has been continued. The record of observations at the city engineer's office has been continued, and its usefulness in lawsuits against the city frequently proven.

The interest taken in the publications (Indications of the Signal Service) has certainly not diminished, and the number of persons seeking information at this office, either in regard to records or other meteorological information, has vastly increased, especially during this spring and early part of the summer.

The records have been ordered frequently in court to further the ends of justice in various important cases, and they have been in all instances looked upon as authorities.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	9,274
Number of Local Reports issued during the year ending June 30, 1877	1,578
Number of Form 15 (manifold) issued during the year ending June 30, 1877	8,574
Number of Form 22 issued during the year ending June 30, 1877	130
Total	19,556

INDIANOLA, TEXAS.

[*Official number*, 84.]

Latitude	28° 32′
Longitude	96° 38′
Mean barometer for the year ending June 30, 1877	30.056
Mean temperature for the year ending June 30, 1877	68°.7
Amount of rain-fall for the year ending June 30, 1877	35.04 inches.

Sergeant I. W. Birt was transferred to another station March 7, 1877, and was relieved by Sergeant H. S. Foster, who is still in charge.

The station was inspected on May 13, 1877, and found in good condition. No change has been made in location of office or instruments since last report.

The interest taken in the service at this station is chiefly in the display of cautionary signals, which always cause a large number of visits to the office.

The sergeant reports that the captains of coasting vessels place much reliance in the signals, and always take advantage of them to secure their vessels.

Monthly reports from this station are published in two papers in Corpus Christi, one in Rockport, one in Victoria, and one in Chero.

Fifty-three cautionary signals were displayed during the year, of which number thirty-three are reported as justified, and twenty not justified. At this station and at Galveston, warning is given of the approach of a "norther" by the display of a white flag with a red center, instead of the regulation cautionary signal flag. The sergeant remarks as follows upon some of these displays:

August 2, 1876.—The mail-steamer blown ashore. Water rose three feet in ten minutes. Citizens terribly frightened.

October 14 *to* 16, 1876.—The comments of citizens were very favorable.

December 17 *and* 18, 1876.—A schooner loaded with mules for South America was delayed by the signal and probably saved her cargo by obeying it. No other results known.

January 11 *to* 13, 1877.—No vessels sailed during the display.

March 23 *to* 25, 1877.—Schooner Alice Taylor put into port on 24th instant, with center-board and anchor gone, and otherwise in distress.

April 24 *and* 25, 1877.—Schooner Crinoline of Galveston, Tex., had her side stove in while lying at the wharf, by the gale.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877..	2,566
Number of Form 22 issued during the year ending June 30, 1877	35
Total	2,601

JACKSONVILLE, FLORIDA.

[*Official number*, 73.]

Latitude	30° 24′
Longitude	80° 40′
Mean barometer for the year ending June 30, 1877	30.064
Mean temperature for the year ending June 30, 1877	67°.9
Amount of rain-fall for the year ending June 30, 1877	53.52 inches.

Sergeant R. McLaughlin was discharged February 15, 1877, at Saint Augustine, Fla., at his own request, and Sergeant F. Z. Gosewich was assigned to the station. Sergeant Gosewich was discharged, re-enlisted, promoted to rank of sergeant, and reassigned to station February 28, 1877.

The office remains in the second story of the Freedman's Bank building, where it has been since the establishment of the station, and the location of the instruments remains unchanged. The station was inspected in June, 1877, and found in excellent condition.

The following extracts are made from the semi-annual report of the sergeant:

The medical profession take a constant interest in the service, and the effects of the different conditions of the atmosphere on disease are closely watched by them.

The sea-faring community are unanimous in their praise of the service, and the display of the cautionary signal is followed by a visit from such sea-captains as intend leaving shortly, and inquiries are made as to the action of the instruments.

The vessels in port never leave while the signal is flying.

The public interest for the service is very decidedly on the increase, and I had that manifested when the rumor was here that it was the intention of Congress to abolish the service, and the greatest solicitude was manifested that such would not be the case.

A report of the local observations is furnished daily to the newspapers and regularly published, and a weekly report of the local observations has been furnished for the use of the Duval County medical society, at the request of Dr. A. S. Baldwin, the president.

Thirteen cautionary signals were displayed during the year, of which number two are reported as justified at the station and eleven not justified.

The sergeant makes the following reports upon some of these displays:

September 16 *and* 17, 1876.—Although not verified at this station, the storm was very severe at Lake George, one hundred and thirty miles south of this place, at New Smyrna and Saint Augustine, at the bar seventeen miles east of this place. No damage known except the blowing down of fences and trees.

October 8 *and* 9, 1876.—Storm very severe at the bar and Mosquito Inlet.

October 15 *and* 16, 1876.—Captain Fitzgerald, of the steamer City Point, reports storm very severe between here and Savannah; also Captain Hemmingway, of steamer Gazelle, reports storm very severe at Mandarin, nine miles south of this place.

October 19 *and* 20, 1876.—Captain Jones, of steamer David Clark, reports that the storm was a gale forty miles south of this place; also very severe on Lake George, one hundred and forty-five miles south of this place. The storm was very severe at Mosquito Inlet. Dayton, nine miles west of the inlet, was overflowed; the steamer Urbana sank; steamer Ina and schooner Ida Smith blown ashore; the entire orange crop destroyed; fences blown down, &c.

December 24 *and* 25, 1876.—It is reported that the storm was very severe at Saint Augustine.

December 29, 1876.—The steamer Erie was sunk in the Saint John's River at this place. She can be raised without much loss.

January 1, 1877.—A number of vessels were detained at the bar by a heavy sea and storm outside.

February 13 *and* 14, 1877.—A heavy gale reported at Mayport, the entrance to the river, which prevented all vessels from putting out to sea. The pilot-boat Betteline had all her sails carried away.

March 25 *and* 26, 1877.—Several captains visited the office. Steamer Sallie Boy delayed departure on account of the signal.

April 12 *to* 14, 1877.—A fearful storm has been raging along the coast, and it is feared much damage has been done.

May 27, 1877.—Storm off Fernandina Bar and Mosquito Inlet; three persons drowned.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1877	497
Number of Form 22 issued during the year ending June 30, 1877	67
Total	564

KEOKUK, IOWA.

[*Official number*, 47.]

Latitude	40° 23′
Longitude	91° 25′
Mean barometer for the year ending June 30, 1877	29.969
Mean temperature for the year ending June 30, 1877	50°.2
Amount of rain-fall during the year ending June 30, 1877	49.41 inches.

Sergeant William Black continues in charge of this station. The assistant at this station was relieved July 24, 1876, in order to reduce the force.

High water occurred July 5, 1876, when it was 14 feet 2 inches, and low water December 7, 1876, when it was 1 foot 11 inches. Navigation opened February 18, 1877, the river being clear of ice on that day. The station was inspected in September, 1876, and found in excellent condition.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	108
Number of Local Reports issued during the year ending June 30, 1877	312
Number of Form 22 issued during the year ending June 30, 1877	18
Total	438

KEY WEST, FLORIDA.

[*Official number*, 25.]

Latitude	24° 32′
Longitude	81° 48′
Mean barometer for the ending June 30, 1877	30.043
Mean temperature for the year ending June 30, 1877	76° .4
Amount of rain-fall for the year ending June 30, 1877	39.08 inches.

Sergeant M. J. Shanefelter was relieved August 14, 1876, for discharge, and was reassigned April 12, 1877, relieving Sergeant H. F. McFarland, who was assigned August 14, 1876, but transferred to Punta Rassa on account of ill health. The station was inspected in May, 1877, and found in excellent condition. No change was made in the location of office or instruments during the year.

Five cautionary signals were displayed during the year, of which number two are reported as justified at the station and three not justified. The sergeant reports as follows upon some of these displays:

September 15 *and* 16, 1876.—The United States schooner Matchless put into harbor, having lost her topmast. A small schooner was blown ashore with both anchors under

her. Ships from the Gulf west of this port report good weather. Vessels paid great attention to the signal.

October 18 *to* 20, 1876.—The Galveston steamer for New York, lying in the harbor, was driven on the bar. The steamer from New York is ashore about seven miles from port.

The building in which the office is located was badly strained, and during the hurricane rocked like a cradle. A lamp on the table was overturned, the wind-vane blown off, and the braces broken. The flag-staff was blown off; shutters and windows were badly damaged; the roof damaged so that the water leaked in and stood on the floor to the depth of three inches. The streets were flooded with water to the depth of several feet, telegraph-lines blown down, and timber flying in every direction. The damage is not yet estimated.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1877	110
Number of Form 22 issued during the year ending June 30, 1877	42
Total	152

KITTYHAWK, NORTH CAROLINA.

[*Official number*, 129.]

Latitude	36° 0′
Longitude	75° 23′
Mean barometer for year ending June 30, 1877	30.044
Mean temperature for the year ending June 30, 1877	57°.7
Amount of rain-fall for the year ending June 30, 1877	67.95 inches.

Sergeant D. D. Stansell was relieved July 13, 1876, for medical treatment. Sergeant J. T. Bradley was in charge of the station until March 7, 1877, when he was transferred to Texas. Sergeant S. W. Naylor was assigned to station March 7, 1877. Private J. A. Perkins was assigned to station April 3, 1877. The station has not been formally inspected since date of last report. No change was made in location of office or instruments during the year. A serious break occurred in the section of telegraph-line between Kittyhawk and Cape Henry in April, several miles of it being entirely washed away. A working party is now engaged in repairing the line, every care being taken to prevent a similar accident in the future. Fifty-two cautionary signals were displayed during the year, of which number forty-one are reported as justified, and eleven not justified. The sergeant remarks as follows in relation to some of these displays:

September 16 *and* 17, 1876.—Two houses blown down. Telegraph-line down.

November 19 *and* 20.—The schooner J. H. Lockwood ashore twenty miles north of Hatteras. No lives lost.

December 24 *to* 27, 1876.—The Italian bark America Pallerano came ashore on the 24th instant; crew saved by the life-saving crew station No. 9. The English bark Tinto came ashore on the 25th instant; crew saved by the life-saving crew station No. 5; the vessel a total wreck.

April 8 *to* 11, 1877.—Telegraph-line down and partly washed away. Schooner Edward J. Hearity, of Philadelphia, ashore eight miles north of station; cargo, yellow-pine lumber; crew supposed to be lost; remnants of clothing found in the rigging.

KNOXVILLE, TENNESSEE.

[*Official number*, 42.]

Latitude	35° 56′
Longitude	83° 58′
Mean barometer for the year ending June 30, 1877	30.054
Mean temperature for the year ending June 30, 1877	55°.3
Amount of rain-fall for the year ending June 30, 1877	43.53 inches.

No change in working force, Sergeant J. K. Payne remaining in charge. No change has been made in location of office since last report. The station has not been inspected during the year.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	624
Number of Form 22 issued during the year ending June 30, 1877	57
Total	681

LA CROSSE, WISCONSIN.

[*Official number*, 87.]

Latitude	43° 48′
Longitude	91° 23′
Mean barometer for the year ending June 30, 1877	29.991
Mean temperature for the year ending June 30, 1877	45°.9
Amount of rain-fall for the year ending June 30, 1877	30.34 inches.

No change has been made in working force, Sergeant J. G. Lynch remaining in charge. The station was inspected in October, 1876, and found in fair condition. The highest water in the river, 4 feet 7 inches, occurred on July 1, 1876, and again on June 2 and 3, 1877. Lowest water, 1 foot 6 inches below bench-mark, occurred on March 29, 1877. The sergeant reports that navigation opened February 27, 1877, the earliest on record at this station, but closed again on the 9th of March, and remained closed until the 27th.

The following extract is made from the semi-annual report of the sergeant:

Weather indications received through the Associated Press, and published in both papers, are eagerly looked for by all classes.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	2,415
Number of Local Reports issued during the year ending June 30, 1877	2,133
Number of Form 22 issued during the year ending June 30, 1877	38
Total	4,586

LEAVENWORTH, KANSAS.

[*Official number*, 52.]

Latitude	39° 19′
Longitude	94° 58′
Mean barometer for the year ending June 30, 1877	29.984
Mean temperature for the year ending June 30, 1877	52°.4
Amount of rain-fall for the year ending June 30, 1877	48.37 inches.

Sergeant Edgar McGovern was relieved December 21, 1876, for discharge, and Sergeant W. D. McChesney assigned to the station and continues in charge at this date. During the year one assistant was relieved on account of sickness and one for discharge. Private H. J. Schulteis, jr., was assigned February 3, 1877. The office was inspected in October, 1876, and found in satisfactory condition.

The sergeant reports that reports of the river received from Omaha during high water were very beneficial to a large number of citizens in this city and vicinity. The highest stage of water in the river occurred June 13, 1877, when the gauge-reading was 19 feet 8 inches, and the lowest stage on December 14, 15, 16, and 17, when the reading was 4 feet 8 inches. One hundred and seventy-six post-offices have been regularly supplied with Farmers' Bulletins from this station. The reduction since last report, in number of offices supplied with these bulletins, was

due to the change in schedule-time of the mail-trains leaving Leavenworth. Many of the offices formerly supplied cannot now be reached in time to make the reports of much value to the public.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1877...	63,350
Number of Bulletins (manifold) issued during the year ending June 30, 1877..	125
Number of Local Reports issued during the year ending June 30, 1877.....	712
Number of Form 22 issued during the year ending June 30, 1877.....	85
Total.....	64,272

LEXINGTON, KENTUCKY.

[*Official number*, 90.]

Latitude.....	38° 8′
Longitude.....	84° 33′

Sergeant E. Lloyd was ordered to Office Chief Signal-Officer July 11, 1876. Was discharged and re-enlisted July 22, and re-assigned to station. The station was discontinued July 24, 1876.

LOGANSPORT, INDIANA.

[*Official number*, 124.]

Corporal C. B. Whiting continues in charge of station, and has satisfactorily performed the duties intrusted to him. The station was inspected in January, 1877, and found to be in excellent condition. This being a printing station only, meteorological observations are not made. One hundred and ninety-one post-offices have been regularly supplied with the Farmers' Bulletin from this station.

The following extract is made from the semi-annual report of Corporal Whiting:

Much interest has been manifested by the citizens and press, the latter publishing that portion of the reports from which benefits for the immediate vicinity might be derived; also publishing the foot-note that accompanies each copy of the farmers' bulletin.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1877....	63,190

LONG BRANCH, NEW JERSEY.

[*Official number*, 113.]

Latitude.....	40° 18′
Longitude.....	73° 59′

This station was discontinued July 8, 1876; Corporal Shadle and Private Bolton, the enlisted men on duty there, being transferred to Sandy Hook.

LOS ANGELES, CALIFORNIA.

[*Official number*, 141.]

Latitude.....	34° 3′
Longitude.....	118° 16′

Sergeant M. M. Sickler was ordered to establish a station at this point, per Special Order No. 62, May 21, 1877, and to commence observations on July 1, 1877. Sergeant C. E. Howgate relieved Sergeant Sickler in charge of station June 16, 1877.

LOUISVILLE, KENTUCKY.

[*Official number*, 64.]

Latitude	38° 18′
Longitude	85° 52′
Mean barometer for the year ending June 30, 1877	300.26
Mean temperature for the year ending June 30, 1877	55°.0
Amount of rain-fall for the year ending June 30, 1877	45.22 inches.

Sergeant E. E. Clements was relieved February 28, 1877, for neglect of duty, Sergeant L. E. Sebree taking charge of the station. Two assistants were relieved from this station during the year for insubordination. Private J. Cassidy was ordered to duty here June 22, 1877. The office was moved March 3, 1877, from the Newcomb building to Courier-Journal building, southeast corner of Fourth avenue and Green streets. The office consists of one room for office proper and one for storage purposes. The new office is centrally located, and is well adapted to the service. The Courier-Journal Company give the office-rooms free of rent-charge for one year. The office was inspected in February, 1877, and the inspector reported that the station-work had been badly neglected. Sergeant Clements was relieved and ordered to Fort Whipple, Virginia, and Sergeant Sebree, who had been highly complimented by the inspecting-officer for ability and attention to duty, and whose station at Rochester, N. Y., had been pronounced in perfect condition, was ordered to take charge of the station. Since the change in sergeants the station-work has been satisfactorily performed. High water occurred January 21, when the gauge-reading was 30 feet, and low water occurred December 18, when the reading was 4 feet 1 inch.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	5,558
Number of Local Reports issued during the year ending June 30, 1877	1,460
Number of Form 22 issued during the year ending June 30, 1877	44
Number of Form 26 issued during the year ending June 30, 1877	3,640
Total	10,702

LYNCHBURG, VIRGINIA.

[*Official number*, 44.]

Latitude	37° 30′
Longitude	79° 2′
Mean barometer for the year ending June 30, 1877	30.024
Mean temperature for the year ending June 30, 1877	56°.5
Amount of rain-fall for the year ending June 30, 1877	34.87 inches.

Sergeant H. U. Jones was granted leave of absence from August 14 until October 4, 1876, during which period Sergeant W. O. Bailey was in charge. Sergeant Jones was relieved for discharge and change of station March 13, 1877, by Sergeant J. T. O'Keeffe, who remains in charge, and has given satisfaction.

No change has been made in location of office.

The following extract is made from the semi-annual report of the sergeant:

> The press of the city have taken a deep interest in the service, and both the Daily Virginian and Daily News generously devote a large space in their columns for the publication of the daily and monthly reports.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1877	620
Number of Form 22 issued during the year ending June 30, 1877	25
Total	645

MALONE, NEW YORK.

[*Official number*, 131.]

Latitude	44° 50′
Longitude	74° 20′

Sergeant P. Bellville remained in charge of the station until April 30, 1877, when he was relieved and the station discontinued.

The office was inspected in July, 1876, and found in fair condition.

The "Indications" were received here and posted daily, Sundays excepted, until the station was broken up.

MANHATTAN, KANSAS.

[*Official number*, 135.]

Latitude	39° 41′
Longitude	96° 32′

The station at this place was discontinued July 31, 1876, and Sergeant H. F. McFarland, the enlisted man on duty, was ordered to Fort Whipple, Virginia.

MARQUETTE, MICHIGAN.

[*Official number*, 50.]

Latitude	46° 33′
Longitude	87° 36′
Mean barometer for the year ending June 30, 1877	*29.964
Mean temperature for the year ending June 30, 1877	*42°.1
Amount of rain-fall for the year ending June 30, 1877	*21.78 inches.

Sergeant W. H. Clendenon was relieved July 14, 1876, by Sergeant J. C. Rogers, and ordered to the office of the Chief Signal-Officer for discharge. Sergeant Rogers remains in charge of station and has given satisfaction. The location of the office and instruments remains unchanged since last report.

The following extracts are made from the semi-annual reports of the sergeant:

The service at this place is highly appreciated, and the interest taken in it is constantly increasing.

The office is visited by the captain of nearly every vessel which comes to this port.

The display of cautionary signals was resumed March 31, although the opening of navigation did not take place until May 5, when the first boat arrived.

December 31, 1876.—I find the service to be highly appreciated here, not only by the diplay of signals, which by navigators are considered of great importance, but also the instrumental indications of the office are consulted daily by those having goods to send by wagons into the interior, and by pleasure parties, &c.

From the opening to the closing of navigation this season. 797 vessels have cleared from this port, the captains of which in nearly every case come to this office to see what the indications are before leaving port. From August 15 to September 15, ninety-four persons visited this office upon business relating to the office.

On September 5 I was called upon to appear in court with the records of this office to testify in a very important case as to the temperature on a certain night. A woman was being tried for the murder of her husband. The prosecuting attorney told me that the records of this office saved the woman from being convicted.

*Only 23 days' observations in June, 1876.

On the 7th of November, I was called up at 2 o'clock in the morning by the captain of the steamer Peerless, who wished to consult the instruments of this office before leaving port. The instrumental indications were such that he remained in port. He told me afterward that if he had left that night, he believed his vessel would have been lost.

The Sault Canal, the outlet of Lake Superior, was closed for the season on November 28. The harbor of Marquette became frozen over on the night of December 8, and on the morning of the 10th the lake was frozen over as far as could be seen with a glass.

Twenty-nine cautionary signals were displayed at this station during the year, of which number fifteen are reported as justified and fourteen not justified at the station.

The sergeant remarks as follows in reference to some of these displays:

August 24 *and* 25, 1876.—The warning was observed by all vessels in port. The office was visited by ship-owners, captains, and others interested in shipping.

September 3 *and* 4, 1876.—No vessels left port during the display.

October 5 *to* 7, 1876.—The schooner Constitution was wrecked off White Fish Point on the night of the 5th. All vessels in port observed the signal.

October 9 *and* 10, 1876.—Few vessels in port; none left.

October 20 *to* 21, 1876.—Heavy rain. Three vessels remained in port.

November 5 *to* 7, 1876.—All vessels remained in harbor. The captain of steamer Peerless visited the office for information.

March 31 *and April* 2, 1877.—Storm, accompanied by rain and snow; navigation not yet open.

May 15 *to* 17, 1877.—Steamer City of Duluth remained in port 36 hours on account of signal.

May 17 *and* 18, 1877.—No vessels left port. The steamer Kewenaw arrived and reports very high winds out on the lake. The wind has driven all the ice out of the bay.

MEMPHIS, TENNESSEE.

[*Official number*, 62.]

Latitude	35° 7′
Longitude	90° 7′
Mean barometer for the year ending June 30, 1877	30.066
Mean temperature for the year ending June 30, 1877	59°.4
Amount of rain-fall for the year ending June 30, 1877	63.74 inches.

Sergeant H. M. Ludwig was relieved July 22, 1876, for neglect of duty, and Sergeant William McElroy placed in charge of the station. No change was made in location of office or instruments during the year. The following extracts are made from the semi-annual reports of the sergeant:

The Memphis Cotton Exchange as well as the Memphis Chamber of Commerce continue to manifest great interest in all that pertains to the signal-service, and to this station particularly. There is not a day passes but some member of either body applies to this office for information regarding the weather, either past, present, or future.

The service is continually gaining friends among all classes in this section, and particularly among those engaged in raising cotton.

Among the merchants and those engaged in the steamboat business, the river reports are highly appreciated. The city press take a great deal of interest in these reports, and devote to them generous space.

During the past six months your observer has been called upon several times to furnish transcripts of the weather, from data on file in this office, to be used as evidence in court where suits have been brought for damages sustained by cotton and other freights, from exposure to the elements, through neglect, &c., on the part of shippers, consignees, and others, and in every case the statement of the sergeant that the paper was a true copy from the records on file in this office has caused it to be received and filed as evidence, a proof that the reports and data are regarded as absolutely correct.

The Farmers' Bulletin continues to grow in favor among the planters. The most popular issue from this station is the river-bulletin. April 9, I was compelled to in-

crease my issue to sixteen daily; on the 16th, increased to twenty; five copies were sent down the river. The steamers generally leave at 5 p. m. sharp, but during the period from April 9 to May 1, 1877, they waited until the river reports were all in.

The manager of the wharf-boat at Friar's Point made fifteen and twenty copies of each report I sent him; the farmers would ride ten and fifteen miles to get a look at it. The captain of the steamer Cohoma had his clerk make twenty copies, and distributed them along the river. The amount of good done by these is simply incalculable. Of the many cases reported to me, one in particular strikes me now.

Mr. Cochrane, a cotton-buyer and large planter, claims to have saved $3,000 from acting on information received at this office.

High water, 33 feet, occurred April 29, 1877, and low water, 10 inches, on January 3, 1877.

The station was inspected in July, 1876, and March, 1877, and found in good condition.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1877	12,708
Number of Bulletins (manifold) issued during the year ending June 30, 1877	7,002
Number of Local Reports issued during the year ending June 30, 1877	1,416
Number of Form 22 issued during the year ending June 30, 1877	176
Number of Form 26 issued during the year ending June 30, 1877	4,118
Total	25,420

MILWAUKEE, WISCONSIN.

[*Official number*, 38.]

Latitude	43° 3′
Longitude	87° 54′
Mean barometer for the year ending June 30, 1877	30.021
Mean temperature for the year ending June 30, 1877	43°.1
Amount of rain-fall for the year ending June 30, 1877	42.87 inches.

Sergeant S. W. Rhode remains in charge of station and has given satisfaction. Sergeant E. B. Garriott was relieved from temporary duty July 25, 1876, and ordered to duty elsewhere. Private D. C. Ralston was ordered to this station January 4, but was subsequently promoted to sergeant, and transferred to Smithville, N. C. The station was inspected in October, 1876, and found in good order. The sergeant in charge of the station was highly complimented in the report of the inspector.

The following extracts are made from the semi-annual reports of the sergeant:

At the special request of the Northwestern Transportation Company, the display of the cautionary signal was continued at this station during the winter months. Mariners rely almost entirely on the signal for warning of approaching gales.

The majority of the lake captains and masters are on the side of caution, and the office is sought for information, when the signal is up, before sailing.

The service continues to grow rapidly in popular favor at this station.

The cautionary signal is invaluable to the marine interest. It is the hope of the public that the service will continue to improve and make favorable progress in its future undertakings.

The propellers Lawrence and St. Albans, of the Northern Transit Line, arrived at this port at 11 p. m. April 25, 1877, five days out from Cleveland, Ohio, being the first arrivals from the lower lakes this season. Cargoes, general merchandise.

Fifty-eight cautionary signals were displayed at this station during the year, of which number thirty-nine are reported as justified at station and nineteen not justified. The sergeant reports as follows in regard to some of these displays:

August 9 *to* 11, 1876.—The schooner C. C. Barnes broke from her moorings in the ship-yard, and was damaged by contact with the dry-docks.

September 5 *and* 6, 1876.—The storm the most severe of the season; the water dash-

ing clear over the breakwater. Considerable damage done to shipping. The Goodrich steamers remained in port.

September 9 *to* 11, 1876.—This port full of vessels on 9th, 10th, and 11th instants, waiting for the gale to abate. Several steamers and steam-barges endeavored to leave on the 9th, but were compelled to return to port. Considerable damage was done to the Northwestern and Lake Shore Railroad.

September 28 *and* 29, 1876.—A heavy sea prevailed on Lake Michigan during the 28th. Several vessels sprung leaks, and several lost portions of their cargoes and canvas, but no serious disasters reported.

October 2 *and* 3, 1876.—A very heavy sea on Lake Michigan. Several vessels put into Chicago with the loss of portions of their canvas.

October 5 *to* 7, 1876.—The boats of the Northwestern Transportation Company did not run from the morning of the 5th to the evening of the 7th. The Goodrich Transportation Company steamers also remained in harbor during the same time.

October 9 *and* 10, 1876.—Storm very severe, and many disasters are reported.

October 20 *and* 21, 1876.—Many captains and vessel-owners visited the office. Many vessels sought shelter in the harbor during the gale, and none left port.

November 5 *to* 7, 1876—Schooner Kate E. Howard missed the pier and went on the beach while entering the harbor at Saint Joseph, Mich., on the 6th inst. A number of sailing-vessels reached Chicago on the 6th with canvas and rigging damaged. Steamer Dix, while trying to enter the harbor, Ludington, Mich., struck the pier and broke her stem. No disasters occurred at or near this port.

November 30 *to December* 1, 1876.—The schooner Hans Crocker water-logged and went ashore at Kenosha, on the 30th, a total loss. A large number of vessels sought shelter in this harbor on the morning of the 30th. The steamers Nebraska and Minneapolis departed at 1 p. m., but were compelled to return at 5 p. m., 30th.

December 8 *and* 9, 1876.—No marine disasters reported; all steamers of the lines running from this port being in harbor. The light-house and harbor-piers at Ludington, Mich., were totally demolished by the gale on the night of the 8th, and a number of buildings in this city in course of construction were badly damaged. The severe cold weather following the gale caused much damage. All sail-navigation suspended.

December 12 *and* 13, 1876.—The Grand Haven steamers remained in port.

December 14 *and* 15, 1876.—The Chicago and Grand Haven steamers remained in port.

December 15 *and* 16, 1876.—The Grand Haven and Chicago steamers remained in port, which is entirely due to the fact that the officers consulted the reports and relied upon them, and prevented disaster to their boats. Had they gone out they could never have reached port. This was the most severe gale for many months at this port. Some damage was done in the city.

January 6 *and* 7, 1877.—The Chicago and Milwaukee and Grand Haven boats remained in port.

January 19 *and* 20, 1877.—The Chicago and Grand Haven steamers remained in port.

February 20 *to* 24, 1877.—The Grand Haven steamers have been laid up for several weeks past, they being unable to penetrate the large masses of ice off Grand Haven. Captain Kirby, of the steamer Minneapolis, reports icebergs there 30 feet high.

March 6 *to* 9, 1877.—Heavy snow fell during the gale. All the railroad-trains were delayed.

March 31 *to April* 2, 1877.—The gale was preceded by a thunder-storm and heavy rain, which latter caused great damage in the interior of the State by washing out railroad-tracks and destroying bridges, &c. Several houses in the city were unroofed, chimneys and signs blown down, and fully one-half of the cellars in the city were flooded.

April 7 *to* 10, 1877.—Several disasters occurred on the east shore of the lake. A vessel was beached and a pier swept away at Holland, Mich.; no disasters on the west shore. The Grand Haven and Chicago steamers remained in port.

April 19 *and* 20, 1877.—Heavy rain fell on the 19th. Schooner Albatross and several other vessels lost portions of their canvass and deck-loads. The damage in the city and surrounding country by the heavy rain was very great.

April 26 *to* 29, 1877.—Steam-barge S. C. Baldwin driven on a reef in Thunder Bay. Schooner H. D. Moore collided with propeller Scotia at Chicago with damage to both. Schooner Black Hawk was thrown on her beam-end in Bailey's Harbor; lost part of her deck-load, righted, and made her way into Chicago. At Green Bay the water was backed up in the Fox River; a great deal of damage from inundation. Other damages to vessels in various harbors caused by crowding together to escape the gale. No vessels left port after the signal was hoisted, and several returned. But for the attention paid to the signal the damage would have been greater.

May 20 *to* 23, 1877.—Several minor disasters occurred, the principal of which are the following: The schooners Wayne, Pilgrims, and E. R. Blake lost each a jib-topsail; schooner Brightie her main-boom; schooner William Jones her fore-topmast and the lift of her foresail; also, schooners Regulator, Jennie, Metropolitan, America, and scow Dan Sickles portions of their rigging. Several vessels remained in port.

May 29 *to June* 2, 1877.—Gale of the 1st instant caused considerable damage in the

city; chimneys and awnings blown down; plate-glass windows broken; several houses unroofed; one house, in course of erection, leveled with the ground; the large signal-lantern and anemometer-ladder broken. Its extent on the lake was comparatively small and its force considerably less. Several vessels lost portions of their canvas.

June 29 to July 1, 1877.—Several vessels suffered a loss of canvas and portions of their rigging on this lake. No serious disasters.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877...	5,895
Number of Local Reports issued during the year ending June 30, 1877.....	569
Number of Form 15 (manifold) issued during the year ending June 30, 1877 ...	3,706
Number of Form 22 issued during the year ending June 30, 1877.....	94
Total	10,264

MOBILE, ALABAMA.

[*Official number*, 27.]

Latitude	30° 42′
Longitude	87° 59′
Mean barometer for the year ending June 30, 1877	30.074
Mean temperature for the year ending June 30, 1877.....	65° .4
Amount of rain-fall for the year ending June 30, 1877	62.37 inches.

Sergeant D. O'Donoghue was relieved September 2, 1876, by Sergeant C. Dill, and ordered to office of the Chief Signal-Officer for discharge. Sergeant Dill remains in charge of station and has given satisfaction. Private Harry Hall was promoted to corporal May 21, 1877, and transferred to Pioche, Nev. Private E. C. Imlay was ordered to this station May 22, 1877. No change was made in location of office or instruments during the year. The station was inspected in April, 1877, and found in good condition.

Ten cautionary signals were ordered for this station during the year, of which number three are reported as justified and seven not justified. The sergeant remarks as follows in reference to some of these displays:

March 8 and 9, 1877.—Several vessels remained in port.

March 17, 1877.—Storm was quite severe thirty or forty miles south of the city.

April 7 and 8, 1877.—Gale very severe. The steamboat Mary lost both her chimneys overboard, and had her cabin badly strained. Fences, awnings, and signs were blown down. A severe tornado is reported at Pensacola, Fla.

April 12 to 13, 1877.—The display was beneficial, as it prevented vessels from sailing and encountering the severe storm outside.

The following extracts are made from the semi-annual reports of the sergeant:

The interest in the service manifested by citizens, the Board of Trade, and the Cotton Exchange continues, and is, if possible, somewhat increased. A meteorological committee has been appointed by both the Board of Trade and the Cotton Exchange. The reliance in our bulletins and reports is absolute.

The indications are implicitly relied upon. The weather-maps at the Board of Trade and Cotton Exchange are carefully scanned each day, and their usefulness appreciated and approved. The meteorological data furnished monthly to the Board of Health are thankfully received, and are studied in connection with epidemic diseases.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877..	4,634
Number of Form 15 (manifold) issued during the year ending June 30, 1877...	1,731
Number of Form 22 issued during the year ending June 30, 1877.....	70
Total	6,435

MONTGOMERY, ALABAMA.

[*Official number*, 26.]

Latitude	32° 22′
Longitude	86° 23′
Mean barometer for the year ending June 30, 1877	30.079
Mean temperature for the year ending June 30, 1877	64°.2
Amount of rain-fall for the year ending June 30, 1877	51.89 inches.

Sergeant William J. Evans has remained in charge of station since last report, and since July 24, 1876, has had no assistant. Private P. F. Lyons was relieved July 24, 1876, in order to reduce the force at station. Sergeant John C. Rogers was relieved from temporary duty and transferred July 14, 1876, to Marquette, Mich. The printing of Farmers' Bulletins was discontinued July 31, 1876. The office was inspected in April, 1877, and found in good condition. No change has been made in the location of office or instruments since the date of last report. The following extracts are made from the semi-annual reports of the sergeant:

I will cite the case of a Mr. M. C. Scott, who owns a two-thousand acre plantation a short distance from the city. During the months of May and June, Mr. Scott very frequently called at the office to examine the daily bulletin, which, taken in connection with the published indications, has been of very great service to him in his farming operations. He reports that there were two occasions on which this was especially true. One was in cutting his hay-crop, and the other his oat-crop, both of which he was enabled, by the warning he had received, to harvest just in time to escape a storm, and save himself the loss of many hundred dollars.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1877	3,044
Number of Bulletins (manifold) issued during the year ending June 30, 1877	5,230
Number of Local Reports issued during the year ending June 30, 1877	336
Number of Form 15 (manifold) issued during the year ending June 30, 1877	2,924
Number of Form 22 issued during the year ending June 30, 1877	18
Total	11,552

MORGANTOWN, WEST VIRGINIA.

[*Official number*, 92.]

Latitude	39° 36′
Longitude	79° 52′
Mean barometer for the year ending June 30, 1877	30.009
Mean temperature for the year ending June 30, 1877	51°.3
Amount of rain-fall for the year ending June 30, 1877	46.82 inches.

Sergeant L. Dunne was ordered to office Chief Signal-Officer for discharge, October 6, 1876. Upon re-enlistment he was promoted to sergeant and reassigned to station, October 18, 1876.

Sergeant Dunne has faithfully performed the work assigned to him. In addition to the regular duties of the office, the sergeant has given instruction in signaling and telegraphy, and in manner of recording meteorological observations, to twenty-two students of the West Virginia University.

No change has been made in location of office or instruments since last report. The station was inspected in February, 1877, and found in excellent order.

Daily observations are made of the change in the Monongahela River, which observations are telegraphed to Washington during high water.

Highest water since last report, occurred January 16, when it was 27 feet 6 inches, and the lowest water was 4 inches, which reading was observed on September 6 and 7, October 29, 30, and 31, and November 1, 2, and 3.

MOUNT WASHINGTON, NEW HAMPSHIRE.

[*Official number*, 46.]

Latitude	44° 16′ 25″
Longitude	71° 16′ 26″
Mean barometer for the year ending June 30, 1877	29.956
Mean temperature for the year ending June 30, 1877	25°.5
Amount of rain-fall for the year ending June 30, 1877	74.71 inches.

Sergeant William Line continued in charge of station during the year, but an order was issued June 30, 1877, transferring him to Toledo, Ohio, and directing Sergeant O. S. M. Cone to assume charge at this place. Private C. J. King was relieved on account of ill health, and Private D. C. Murphy assigned to the station. The work of station has been satisfactorily performed. The station was inspected in July, 1876, and June, 1877, and on both occasions was found in good condition. No change in station work during the year.

The following extracts are made from the journal of the station:

July 25, 1876.—Heavy snow fell, extending down the mountain about a mile, but soon d sappeared under the warm rays of the sun.

August 21, 1876.—The wind blew a hurricane, and frost-work formed early in the morning. On the 22d the wind reached a velocity of 90 miles per hour in the morning, decreasing to 60 miles in the afternoon. Trains on the Mount Washington Railway were delayed by the storm.

September 2, 1876.—Velocity of wind 84 miles in p. m., decreasing to 60 miles at midnight.

September 3, 1876.—Ice and frost-work commenced to form.

October 7, 1876.—Wind blew a hurricane from 2 p. m. to 5 p. m.

November 6, 1876.—Velocity of wind 80 miles at 9 p. m., which increased to 100 by midnight, and was accompanied by snow.

November 12, 1876.—Velocity of wind reached 84 miles per hour.

December 9, 1876.—Velocity that of a hurricane until 1 p. m., when it became calm very suddenly, and remained so until about 1.45 p. m., when it began to blow as suddenly as it had ceased, and at 4.57 p. m. it reached the rate of 140 miles per hour; at 8.30 p. m. the velocity was very great, but it was impossible to measure it o account of hurricane; at 9 p. m. it was blowing at the rate of 120 miles per hour, and so continued until midnight.

December 15, 1876.—Wind reached 120 miles per hour.

December 16, 1876.—Temperature fell to —40°, and the mean temperature for the day was —22°.5, with the wind at 80 miles at 7 a. m.; 120 miles at 12.22 p. m.; 160 miles at 4.57 p. m.; 100 miles at 9 p. m.; and 180 miles at midnight. The force of the wind was terrible, and at times masses of ice would be blown loose from the rocks, making it extremely dangerous to stand even under the lee of the building. The window was fastened with planks, in case of accident. 'Tis a fearful night.

December 17, 1876.—Hurricane still continues; lowest temperature —45°, and the mean temperature for the day —17°.5; the wind's velocity was greatest from 1.15 to 1.30 a. m., when it must have reached 200 miles per hour, and continued until long after daylight.

December 19, 1876.—Wind reached 100 miles per hour.

December 24, 1876.—Wind reached 120 miles per hour, and in the night must have reached 160 miles, blowing in gusts, some of which are reported as frightful.

NASHVILLE, TENNESSEE.

[*Official number*, 63.]

Latitude	36° 11′
Longitude	86° 53′
Mean barometer for the year ending June 30, 1877	30.042
Mean temperature for the year ending June 30, 1877	58°.0
Amount of rain-fall for the year ending June 30, 1877	47.13 inches.

Sergeant A. C. Ford has remained in charge of the station since last

report. The station work has been satisfactorily performed. Private P. F. Lyons was ordered to this station December 27, 1876. Private John Healy was promoted to corporal and transferred May 21, 1877, to Winnemucca, Nev. One assistant was relieved during the year for drunkenness. Since May 9, 1877, a civilian printer has been on duty at this station. No change has been made in the office or any instrument since last report. Ninety-eight post-offices have been supplied with the Farmers Bulletin from this station.

Sergeant Ford accompanied Professor King in two balloon ascensions during the year. Valuable series of observations were made during these ascensions and forwarded to Office Chief Signal-Officer. High water at this point occurred January 22, 1877, and low water on October 19, 20, and 21, when the gauge-readings were 40 feet 4 inches and 10 inches respectively. The station was inspected in September, 1876, and found in excellent order.

The following extracts are made from the semi-annual reports of the sergeant:

The special river reports from Chattanooga, Johnsonville, and Decatur, are especially valuable at this station at the seasons when they are received.

The information furnished the press has come to be of recognized value, and great care is taken to secure accuracy in the reports.

On July 20 the board of health of Nashville unanimously adopted a memorial to the Congressmen from this State, setting forth the necessity of the work of the Signal Service to the community, and its possibilities of greater good if properly endowed by Congress, and asking their efforts in its behalf.

The forecasts of the weather in the Farmers' Bulletins have become so accurate that they are generally consulted with perfect confidence by those having journeys to make, harvests to gather, or any other interest in the coming weather.

The most striking illustration of the practical benefit of these forecasts was afforded in July last, when the Farmers' Bulletin predicted for this section "thunder-storms." Several farmers removed their grain from the low lands, where there was danger of overflow, and the next morning saw the fields swept by the flood.

The popularity of the service is on the increase among all classes, and no one thinks of doing without the reports.

The board of health of the city continues to make practical use of the observations, carefully noting atmospheric conditions which accompany various prevalent diseases.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1877	36,192
Number of Bulletins (manifold) issued during the year ending June 30, 1877	6,367
Number of Local Reports issued during the year ending June 30, 1877	312
Number of Form 22 issued during the year ending June 30, 1877	152
Number of Form 26 issued during the year ending June 30, 1877	3,199
Total	46,222

NEW HAVEN, CONNECTICUT.

[*Official number*, 96.]

Latitude	41° 17′
Longitude	72° 57′
Mean barometer for the year ending June 30, 1877	29.989
Mean temperature for the year ending June 30, 1877	51°.0
Amount of rain-fall during the year ending June 30, 1877	48.98 inches.

No change has been made in the location of office, instruments, or in the work of the station during the year. The rent of office, cost of lights and fuel, were borne by the citizens of New Haven, the Signal-Office not being put to any expense in these matters during the year ending June 30, 1877. The entire cost of maintaining the station will, in future, be borne by the service. Sergeant M. F. Tighe has continued in charge of

the office since last report. Sergeant J. D. Sumet was assigned temporarily to the station August 14, 1876, but was subsequently reduced to the ranks as a private soldier for neglect of duty at Punta Rassa (his former station), and transferred to Wood's Holl, Mass., October 4, 1876. This station was inspected twice since last report, once in August, 1876, and again in May, 1877, and was found in good condition. Forty-six cautionary signals were displayed during the year, of which number twenty-two are reported as justified, and twenty-four not justified at the station. The sergeant remarks as follows, in regard to some of these displays:

July 28 *and* 29, 1876.—Tug-boats for New York had to return, the sound being too rough for them to proceed.

September 2, 1876.—The tug James Watson, with four coal barges in tow, left this port for New York in the morning, but found it necessary to return in a few hours.

September 16 *and* 18, 1876.—Numerous coasting vessels came into port for safety and remained during the gale. In the city, awnings, limbs of trees, and young trees, and in West Haven bath-houses were blown down. The steamer Continental, from New York to New Haven, was delayed three hours by the storm.

October 6 *and* 7, 1876.—The dock superintendent reports that incoming vessels encountered heavy rain and high winds on the sound. Several vessels remained in the harbor until the signal was lowered.

October 10 *and* 11, 1876.—Many schooners remained in harbor over night.

October 20 *to* 22, 1876.—A very dense fog prevailed; so dense at night that the lantern could not be seen from the pavement. No vessels left port except the regular steamers, and they were several hours behind time, owing to the fog.

November 2 *and* 3, 1876.—Heavy rain fell on the morning of the 3d inst. Six schooners loaded with lumber remained in on account of the signal.

November 6 *and* 7, 1876.—The dock superintendent states that the warning proved to be of great advantage to them at the docks.

November 15, 1876.—Many interested persons called at the office for information. The warning was well and carefully noticed.

November 18 *to* 21, 1876.—The signal was of great benefit to many. Over 150 schooners took refuge in the harbor. Very little damage was done, either in the harbor or city, all precautions having been taken upon the display of signal. The sound steamers experienced one of the heaviest gales ever known on that body of water. Captain Peck, of the steamer Continental, reports the sound perfectly clear of sailing-vessels, and all steamers were compelled to put into port for shelter.

December 9 *and* 10, 1876.—The storm is reported as the most severe since the sleet-storm of 1872. Considerable damage was done to buildings. Among those injured were the chapel of Yale College, county jail, and the insurance building. The schooner J. H. Yeomans dragged her anchors and struck near "the cove," filled and sunk. Nothing of value could be saved from her. No other disasters reported.

December 16, 1876.—The harbor was full of coasters during the display, but no accident occurred. The wind blew a horse-car from the track; a top-buggy was overturned; a small store-house was lifted from its foundations and carried about 300 feet.

December 18 *and* 19, 1876.—The harbor full of ice, which interferes with navigation.

December 29 *and* 30, 1876.—A severe storm, but little damage was done to vessels in the harbor, they having prepared for it. The tide was very high, flooding the floor of the steamboat company freight-house. Steamers and vessels on the sound were compelled to seek harbor. No vessel attempted to leave port.

January 1 *and* 2, 1877.—No vessels attempted to leave harbor, except the New York steamers, which left on time, but had to return on account of the wind and ice.

February 12 *and* 14, 1877.—Very little damage was done, every precaution having been taken to prevent it. A few pleasure-yachts in the harbor were driven ashore.

February 23 *and* 25, 1877.—A severe gale. No vessels left port, except the regular-line steamers.

March 8 *to* 10, 1877.—Much damage was done by the gale along the coast and surrounding country. A large number of vessels went ashore, and others were otherwise damaged. Very little damage was done in the harbor, as every precaution was taken to secure the shipping as soon as the signal was hoisted. Buildings were damaged; fences, chimneys, trees, &c., were blown down.

March 25 *to* 30, 1877.—The display was of great benefit; over two hundred vessels took refuge in the harbor. The weather was fearful; rain, snow, and sleet, with dense fog. Nothing left the harbor during the week, except the regular steamers, and they were not on time. Several vessels left port on the 30th, but were compelled to return.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1877	312
Number of Form 22 issued during the year ending June 30, 1877	78
Total	390

NEW LONDON, CONNECTICUT.

[*Official number*, 14.]

Latitude	41° 22′
Longitude	72° 9′
Mean barometer for the year ending June 30, 1877	29.994
Mean temperature for the year ending June 30, 1877	49°.4
Amount of rain-fall for the year ending June 30, 1877	48.82 inches.

Sergeant George H. Crane was transferred September 18, 1876, to Fort Gibson, Ind. Ter., and relieved by Sergeant I. A. Reed, who remains in charge, and has attended to his duties in a satisfactory manner. One assistant was relieved and one assigned to the station during the year. No change has been made in location of office or instruments since last report. The station was inspected in August, 1876, and May, 1877, and found in good condition.

Forty-six cautionary signals have been displayed during the year, of which number twenty-two are reported as justified at station and twenty-four not justified.

The sergeant reports as follows in regard to some of these displays:

September 2, 1876.—All sailing-vessels remained in port.

September 16 *to* 18, 1876.—Ninety-five sailing-vessels put into this port for shelter. The schooner Champion went ashore on Race Rock. The yacht Pearl dragged her anchor and went ashore in the lower harbor.

October 6 *and* 7, 1876.—Many vessels remained inside the harbor during the display. None ventured outside.

October 10 *and* 11, 1876.—The schooner Kenduskeag, of Bangor, Me., lost bowsprit, jib-boom, and foremast, off Faulkner's, storm of 6th and 7th; towed to port by a tug; loss $250 to $350.

October 14 *to* 16, 1876.—There seems to have been a severe storm off the coast, and many disasters are reported. Seventy-five vessels of different kinds took advantage of the signal and remained in port. Wind of the 14th and 15th reported violent enough, in the vicinity of the station, to damage fruit-trees, fences, &c.

November 6 *and* 7, 1876.—Schooner Ontario, from Newport to New York, went ashore near the light-house, losing her sails; was towed off by tug Burnside.

November 18 *to* 21, 1876.—One hundred sail-vessels remained in harbor and no departures took place. The steamer City of Norwich met with very rough weather between New York and this port, and was compelled to put into Hempstead, where she remained, in company with the steamer Bristol of the Fall River line and Electra of the Providence line, until the morning of the 22d. The storm, although unusually severe, has not been attended with any disasters.

December 9 *and* 10, 1876.—The steamer Bristol, of the Newport line, put into this port on the 10th instant for repairs, having broken her steering-gear in the storm. Schooner David Sprague, of New London, was dismasted about three miles east of Montauk light. The sound steamers generally sought harbor and escaped disaster. Many vessels came into harbor for shelter, one or two of which dragged their anchors, but sustained no damage. The men at the works on Race Rock were in considerable peril, but were taken off in safety.

December 16, 1876.—The gale was one of the most severe of the season; thirty-five or forty vessels sheltered in the harbor, nearly every one of which dragged their anchors. The three-masted schooner William Mason went ashore on the east side of the bay; was hauled off by tugs with but little damage.

December 29 *and* 30, 1876.—The tide was higher than has been known for twenty years, and although the storm was one of the most severe experienced for years, no disasters of any account occured here; some of the small craft broke their mooring. The New York steamers were compelled to lay by in the Thames. The large iron ship Circassian, ashore at Bridgehampton, Long Island, broke up with an awful crash, and twenty-nine out of thirty-three men on board were lost. Many vessels went ashore at Provincetown, Mass.

January 6 *to* 8, 1877.—Two steamers of the Fall River line took shelter in the harbor during the storm.

January 8 *and* 9, 1877.—One vessel went ashore off the mouth of the harbor.

February 12 *to* 14, 1877.—The schooner Harriet Chace lost sails in the gale, and was towed into the harbor by revenue-cutter Mosswood for repairs.

February 19 *and* 20, 1877.—The schooner Cygnus, with a load of lumber, went ashore in a squall early on the morning of the 19th, on Long Island, seven miles west of Horton's Point, and now lies filled with water.

February 23 *to* 25, 1877.—Three schooners were lost in Long Island Sound; two struck on a rock and sunk, and one capsized; nine lives were lost. Great damage was done in all ports along Long Island by the storm.

March 2 *and* 3, 1877.—Two schooners were sunk in the sound during the gale. No lives lost.

March 7, 1877.—Schooner Mary E. Rankin went ashore on Fisher's Point, opposite Race Rock, and filled with water.

March 8 *to* 10, 1877.—Rain fell in torrents. But little damage done in the harbor, although many of the vessels dragged their anchors. The tide was unusually high; the waves in the harbor were at least 20 feet in height. Some damage was done to buildings, &c., in city and the surrounding country. The ferry-boats were compelled to stop running. A large schooner, name unknown, is reported ashore at South Lynne, and the schooner D. W. Vaughn, ashore on Race Point, was broken up during the gale.

March 16 *and* 18, 1877.—Schooner John Rose, with coal, went ashore in a snow-storm, on night of 16th, near Westerly, R. I., and will prove a total loss. Bark Gan Eden ashore on Martha's Vineyard in snow-storm.

March 21 *and* 22, 1877.—United States steamer Cactus attempted to go out while signal was flying, but was compelled to put back and reman in until the signal was lowered.

March 25 *and* 29, 1877.—The storm was very destructive here and in vicinity; the rain poured in torrents. The rain-fall from 11.19 p. m. 25th to 11.19 p. m. of 26th was 3.81 inches. A large fleet of vessels anchored inside the harbor, the greater number of which remained until the signal was lowered. No accidents in the harbor. Among the vessels which put in for shelter were the United States cutters U. S. Grant and Dexter. The schooner Anna C. Platt went ashore near Shinnecock light; one or two lives lost. Schooner Agnes picked up four men out in an open boat, being part of the crew of a vessel wrecked on Plum Gut Island two of the crew of which were lost, the name of vessel unknown. The instruments of the station were consulted by the commander of the United States cutter U. S. Grant, and by many others interested. In the country dams were swept away, railroad-tracks washed out, many buildings destroyed, immense destruction to manufacturing property, and loss of several lives, were some of the disastrous effects of the storm. The loss at Staffordsville, Conn., alone amounting to more than a million of dollars.

April 6, 1877.—A number of vessels anchored inside the mouth of the river.

June 10 *and* 11, 1877.—Schooner Caroline N. Kingle, of Bridgeton, N. Y., from Philadelphia, Pa., for Salem, Mass., loaded with coal, went ashore on Block Island on 10th instant, and went to pieces; part of the cargo will be saved. An unusually large number of vessels remain at anchor.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877..	4,632
Number of Form 22 issued during the year ending June 30, 1877	64
Total	4,696

NEW ORLEANS, LOUISIANA.

[*Official number*, 28.]

Latitude.....	29° 58′
Longitude	90° 7
Mean barometer for the year ending June 30, 1877.....	30.060
Mean temperature for the year ending June 30, 1877.....	67°.8
Amount of rain-fall for the year ending June 30, 1877	43.83 inches.

Sergeant Nelson Gorom continues in charge of station, and has been attentive to his duties. Private Orin Parker was relieved July 24, 1876, for promotion, and replaced by another assistant. No change has been made in the location of the office or instruments since last report.

The following extracts are made from the semi-annual reports of the sergeant:

The usual interest has been taken in our reports by all business men and the public in general.

The members of the cotton exchange derive the most benefit from the service, as the majority of the a. m. reports are from the cotton regions.

The members of the press take the usual interest in the service; all papers publish the indications as furnished by the agent of the Associated Press, and made up from the 4.35 p. m. reports.

The station is supplied with three large weather-maps, which are changed daily; they are located at the cotton exchange, merchants' exchange, and Decan, Zerega & Co.'s All are consulted daily by a large portion of the business community, and from which a great deal of information is derived; especially is this the case at the cotton exchange and Decan, Zerega & Co.'s

A copy of the river report is still furnished to the operator of the jetty company, who transmits it to the resident engineer of the company at the mouth of the river. The "indications" for this section are also sent.

The station was inspected in April, 1877, and found in good condition.

The highest stage of water occurred May 30 and June 1, 1877, when the gauge-reading was 3 feet 7 inches below high-water mark of 1874, and low water occurred December 30, 1876, when the reading was 16 feet 2 inches below bench-mark.

Fourteen cautionary signals were displayed at this station during the year, of which number five are reported as justified at the station, and nine not justified. The sergeant remarks as follows in reference to some of these displays:

April 7 and 8, 1877.—A building used as a rope-walk blown down; damage, $500.

April 12 and 13, 1877.—No damage in vicinity of station; a fearful tornado or cyclone is reported from Pensacola, Fla., which completely destroyed thirty-one houses, tore up immense trees by their roots, wrecked a number of vessels in the harbor, killed one person, and did much other damage.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1877	1,380
Number of Bulletins (manifold) issued during the year ending June 30, 1877	7,137
Number of Local Reports issued during the year ending June 30, 1877	49
Number of Form 22 issued during the year ending June 30, 1877	55
Number of Form 26 issued during the year ending June 30, 1877	6,172
Total	14,793

NEWPORT, RHODE ISLAND.

[*Official number*, 130.]

Latitude	41° 29.
Longitude	71° 19
Mean barometer for the year ending June 30, 1877	29.980
Mean temperature for the year ending June 30, 1877	94°.0
Amount of rain-fall for the year ending June 30, 1877	47.78 inches.

Sergeant L. H. Foster was relieved August 8, 1876, for discharge, and Sergeant J. Craig assigned to the station. Sergeant Craig has been distinguished for careful attention to duty and the accuracy of his reports. No change was made in location of office or instruments during the year. The station was inspected in August, 1876, and in June, 1877, and on both occasions was found in good condition. Telegraphic reports are not received from this station.

Forty-five cautionary signals were displayed during the year, of which

number twenty-one were reported as justified at station, and twenty-four as not justified.

The sergeant remarks as follows in reference to some of these displays:

September 16 *to* 18, 1876.—No vessels left port.

October 6 *and* 7, 1876.—Between forty and fifty fishing-vessels put into the harbor shortly after the signal was hoisted.

October 14 *to* 16, 1876.—Capt. C. E. Gardner, harbor-master, reports that a large number of vessels put into the harbor.

November 18 *to* 21, 1876.—No marine disasters reported. The steamer Providence detained in port by storm. A number of trees and fences blown down; no vessels left port.

December 9 *to* 11, 1876.—A large number of vessels took warning and remained in port. The steam ferry-boat and fort launch were obliged to discontinue their trips on account of the heavy sea. The schooner Eva I. Smith went ashore near Blue Rock, upper harbor. All the regular line steamers were delayed in their trips. Later accounts report quite a large number of wrecks along the coast and in the harbor, with some loss of life; the weather was intensely cold.

December 16, 1876.—Two vessels went ashore at Blue Rock, and several others lost sails and bulwarks; one lost her deck-load of 20,000 feet of lumber.

December 18 *and* 19, 1876.—A large fleet of vessels remained in port. The steam-launch General Jessup, of Fort Adams, broke her shaft and screw.

December 29 *and* 30, 1876.—A hurricane, which was accompanied by sleet and afterward by rain. A large number of vessels put into the harbor for shelter on account of the signal. The steam-launch General Jessup was sunk at her moorings in the harbor, and the engineer escaped drowning by climbing the smoke-stack. The New York steamers delayed departure until the storm was over. Some minor accidents occurred in the harbor.

January 12 *and* 14, 1877.—A large number of vessels took warning and remained in port.

January 24 *and* 25, 1877.—Two schooners put into port, one leaking and one with loss of flying-jib.

February 12 *to* 14, 1877.—A number of vessels took warning and remained in port.

February 23 *to* 25, 1877.—Schooner Cornelia went ashore at Beaver Tail, and was wrecked. The schooner Angler lost fore and main sail. Both vessels left this port on the 24th. Signal was justified within three miles of the port.

March 7, 1877.—Between fifteen and twenty vessels were detained in port.

March 16 *to* 19, 1877.—Fifteen vessels took warning and remained in port. Schooner John Rose, coal laden, ran ashore and went to pieces on Noyes Beach, 16th instant.

March 26 *to* 29, 1877.—Dense fog, which prevented many vessels from leaving.

May 2 *to* 4, 1877.—A large fleet of vessels took warning and remained in port. One vessel left, but was compelled to put back. Schooner Michael Collins, of New York, capsized off Beaver Tail; crew were saved by a passing vessel.

The following extracts are made from the semi-annual reports of the sergeant:

The interest in the service continually increases.

The cautionary signals are looked upon with general interest, few vessels leaving port while the signals are displayed.

The chairman of the meteorological committee, Capt. Samuel Baily, gives the service his warm support, and is always ready to co-operate in the promotion of its interests.

The cautionary signals are held in as high regard as ever by commercial men and mariners, a vessel seldom leaving port while the signals are displayed. Several instances have happened to my knowledge when the signals were reported as not justified, when within five miles of here the wind blew a gale.

NEW YORK, NEW YORK.

[*Official number*, 15.]

Latitude	40° 42′ 43′
Longitude	74° 0′ 3″
Mean barometer for the year ending June 30, 1877	30.013
Mean temperature for the year ending June 30, 1877	50°.9
Amount of rain-fall for the year ending June 30, 1877	41.39 inches.

Sergeant H. J. Penrod continues in charge of the station since last report, and has performed his duties satisfactorily. One assistant has

been ordered to this station, one relieved and ordered to Fort Whipple, Virginia, for promotion, and one transferred to another station. The printing at this station has been done by a civilian printer since April 1, 1877.

The station was inspected in December, 1876, and May, 1877, and found in good condition.

The office still remains in the Equitable Life Assurance Company building. New office rooms are being prepared by the company in the same building, and will soon be ready for occupancy.

Seven hundred and four post-offices have been regularly supplied with the Farmers' Bulletin from this station.

Fifty cautionary signals have been ordered for this station, of which number twenty-six are reported as justified at the station and twenty four not justified. The sergeant remarks as follows in reference to some of these displays:

September 16 *to* 18, 1876.—The signal was generally heeded; some few vessels bound south remained in port.

From the New York Daily Tribune, September 19, 1876: "Extraordinary gales, shipwrecks, very heavy rains, and much damage to property during Saturday and Sunday is reported from all important points along the Atlantic coast. * * * Much shipping is ashore in the Southern States."

November 18 to 21, 1876.—Not much damage done in the vicinity of New York.

The New York Herald of November 21, 1876, says: "The rain-storm of yesterday was the severest of the year. Street-cars were impeded in their travel by reason of the excessively high wind and rain. Tug-boats and ferry-boats suffered considerably, sign-boards and chimney-pots were carried away. Railroad-travel was affected, and numerous trains were delayed on the roads leading into the city. The Croton water-shed benefited immensely by it, and the city of New York is relieved from the perplexing anxiety of a water-famine. Business was paralyzed in every direction. The shipping along the river-fronts experienced more or less damage. Travel by steamer very difficult, and in some cases almost altogether impeded. Political banners were torn and carried away in every direction, and cellars in the lower parts of the city were flooded. In Brooklyn, chimneys were carried away, houses unroofed, sign-boards, telegraph-lines, and window-shutters blown down, and one man had his leg broken. In the neighborhood of Jersey City the meadows were overflowed and much other damage done. Much damage was done to the surrounding towns, and much inconvenience to the inhabitants by the flooding of cellars, streets, houses, meadows, and low parts of the country. In the submerged districts in the vicinity of Hoboken, boats were in constant use as a means of getting from place to place. But few marine disasters occurred, all vessels which could having sought shelter in the safest harbor which could be reached by them. The Annie C. Cook, of New York, loaded with salt, went ashore at Shinnecock light, and will probably prove a total loss, as the heavy sea was breaking over her. The bark W. A. Farnsworth lost both of her anchors near City Island, and is now lying in a disabled condition off Throgg's Neck. Attempts will be made to save her from complete wreck."

December 8 to 10, 1876.—This storm is reported as terrific, and much local damage was done, and many persons were injured, some losing their lives, and one or two dying from exposure and the intense cold. A number of marine disasters occurred along the coast, and vessels in the harbor dragged their anchors, and were torn from their moorings at the wharves. Travel and business were almost entirely suspended. Outside the city the damage was very great. The warning was timely, and was favorably commented on by the press.

December 14 to 16, 1876.—This storm was of unusual severity, and its ravages were very great. Warned by the experience of the previous storm, the superintendent of public buildings caused the removal of all political banners, &c., likely to be dangerous in a storm. Several vessels are ashore in the vicinity of the station. The signal was heeded by shipping people.

December 17 *to* 19, 1876.—Gale, accompanied with rain, sleet, and snow. All kinds of outdoor business and travel were much interfered with.

December 29 *and* 30, 1876.—The ship Circassian, ashore on Long Island coast, was dashed to pieces, and twelve of the crew drowned; also sixteen wreckers.

January 1 *to* 2, 1877.—Traveling was delayed by the heavy snow.

March 8 *to* 10, 1877.—The damage from this storm was wide-spread and serious, the losses being estimated at upward of $100,000. Houses were unroofed, chimneys and signs were blown down, awnings were torn to pieces, windows broken in, trees were uprooted, and houses in the suburbs were flooded and damaged by water. Vessels

dragged their anchors, and others were broken from their moorings, and many collisions occurred. One schooner was sunk, and one man drowned. Eleven persons are known to have been injured by flying missiles—one person fatally.

The following extracts are made from the semi-annual reports of the sergeant:

The signal is always observed by the shipping people, and the same interest is manifested as formerly. No special benefit from the signal has been noted at this station.

The large signal light is always seen, when lit, a long distance down the bay.

All of the New York, Brooklyn, and Jersey City papers publish part or the whole of the central office deductions, as given the press, and a few lately give the full synopsis and indications, notably the New York Times and Journal of Commerce.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1877	225,182
Number of Bulletins (manifold) issued during the year ending June 30, 1877	9,361
Number of Maps issued during the year ending June 30, 1877	4,653
Number of Form 22 issued during the year ending June 30, 1877	290
Number of Form 26 issued during the year ending June 30, 1877	2,292
Total	241,778

NEW RIVER, NORTH CAROLINA.

[*Official number*, 138.]

Latitude	34° 30
Longitude	77° 23

Corporal C. C. Corbin was detailed on temporary duty with repair party under First Lieut. C. A. Booth May 9, 1877, and continues on this duty. Private J. W. Case was relieved May 9, 1877, for drunkenness.

During the severe storm of September 17, 1876, much of the property was swept away and lost. The station was moved to the north side of the inlet, and on November 28 the office was moved to Dr. E. W. Ward's house, near the inlet. On May 9 some of the property was stored with Dr. Ward, some transferred to Cape Lookout, and the station was temporarily discontinued until such time as the sea-coast telegraph line should be repaired to this point.

NORFOLK, VIRGINIA.

[*Official number*, 30.]

Latitude	36° 51′
Longitude	76° 19′
Mean barometer for the year ending June 30, 1877	30.041
Mean temperature for the year ending June 30, 1877	57°.7
Amount of rain-fall for the year ending June 30, 1877	53.65 inches.

Sergeant E. W. McGann was discharged the service at expiration of his term of service, re-enlisted, promoted sergeant and re-assigned to station February 28, 1877. Sergeant McGann was transferred May 18, 1877, to Baltimore, Md., being relieved by Sergeant William Stein. Sergeant McGann has faithfully attended to his duties. One assistant was relieved from duty on account of drunkenness, and one transferred to another station. No change was made in location of office or instruments since last report. The station was inspected in March, 1877, and found in good condition.

The following extracts are made from the semi-annual reports of the sergeant:

The display of cautionary signals is anxiously looked for by all captains of outgoing vessels, and, as a general rule, no vessels leave this port until the cautionary signal is

lowered. In this connection it might be well to state one notable instance in which the signal was totally disregarded. On March 24, the splendid steamship Rockaway was launched at Norfolk, amid the general rejoicing of the shipping interest of this port, which felt justly proud of being able to produce such an excellent specimen of naval architecture, and which were desirous of producing a favorable impression in northern seaports, as to the advantages in Norfolk for ship-building. The Rockaway not having her machinery yet aboard, was to be towed to New York for that purpose, the owners engaging the steamer Wyanoke, Captain Coush, to take her in tow. Signals were hoisted at this station, just two hours previous to her departure, and notwithstanding the attention of the captain and owners being called to the fact, they persisted in starting to sea. On the next day the Rockaway encountered a terrible northeast storm, on the coast of New Jersey, which, in her then condition, she was not at all capable of weathering, and consequently became a total loss.

On March 22 the British ship Winchester, and on March 26 the Italian barks Franceshino and Monte Tabor and the Norwegian bark Pantser were reported ashore near Cape Henry, Virginia, and by means of the telegraphic communication between that point and this station, assistance was rendered so promptly that the three first-named vessels were gotten afloat, and saved without any serious damage. The Norwegian bark Pantser having sprung a leak shortly after she ran ashore, was abandoned, but all her crew and rigging were saved by assistance indirectly secured by means of this telegraph communication.

The interest taken in the service, as manifested by the local press of this city, is very gratifying. All the daily papers, the Norfolk Virginian, Norfolk Landmark, and Public Ledger, publish the reports furnished to them by this office. The office is consulted daily by all classes, especially by sea-captains and truckers, and all are guided, as I am informed, with excellent results, by the predictions furnished by the service.

Forty-one cautionary signals have been displayed during the year, of which number twenty-one are reported as justified at the station, and twenty not justified. The sergeant remarks as follows in reference to some of these displays:

September 2, 1876.—A heavy gale prevailed in Hampton Roads; the outward-bound vessels remained in port.

September 16 *and* 17, 1876.—The signal gave timely warning. The gale was very severe, delaying the arrival and departure of all vessels. Many accidents occurred by vessels dragging their anchors and colliding. The ferry-boats were compelled to stop running for several hours.

October 14 *and* 15, 1876.—All vessels remained in port. One schooner injured off New Point Comfort.

October 19 *to* 21, 1876.—Several vessels remained in port.

November 6 *to* 7, 1876.—Four outward-bound vessels remained in port.

November 19 *and* 20, 1876.—Three vessels remained in port.

November 30 *to December* 2, 1876.—Two small steamers bound south, and two ships bound to Europe, delayed their departure.

December 8 *to* 10, 1876.—Ship Tobique dragged her anchors and was blown ashore on Lambert's Point. Schooner Racer was totally dismasted off Hog Island. Several disasters occurred on Chesapeake Bay. The steam-launch of the United States steamer Hartford broke loose from her moorings and was in great peril; a barge with fourteen men went to her rescue, but were benumbed with the cold and the boat incased with ice—they were afterward rescued by the steamer Sue. The launch drifted on the Horseshoe and came to anchor.

December 18 *and* 19, 1876.—Three large ships, laden with cotton for Europe, delayed their departure. The Baltimore mail-steamer was compelled to return on account of the gale in the roads. Steamers due here from Baltimore arrived thirty hours late, and report gale on Chesapeake very severe.

December 29 *and* 30, 1876.—All vessels remained in port. A large fleet of vessels were compelled to seek shelter in Hampton Roads.

January 1 *and* 2, 1877.—All outward-bound vessels delayed departure.

February 17, 1877.—The steamer Florida collided with and sunk the schooner Marion R, opposite to the city; all hands saved.

February 19 *and* 20, 1877.—United States revenue-cutter Colfax remained in port.

March 2 *and* 3, 1877.—A small oyster-sloop was capsized in the harbor; no lives lost. The Russian flag-ship Svetland dragged her anchor and went ashore; she was gotten off without injury. All outward-bound vessels remained in port.

March 16 *and* 18, 1877.—A small schooner, laden with oysters, was capsized in the

bay. The schooner Matilda went ashore on Lynn Haven Beach, on 17th. The schooner Cora S. Van Gilder sprang a leak off Chincoteague and put in here for repairs. An unknown schooner went ashore at Western Branch. All the vessels of the Russian fleet housed their top-masts and let go extra anchors. No vessels left port.

March 21 *and* 22, 1877.—Ship Winchester was blown ashore near Cape Henry on a. m. of the 22d instant.

March 24 *to* 28, 1877.—The steamer Rockaway, in tow of steamer Wyanoke, left port for New York during the display, and is now ashore at Atlantic City, N. J. An unknown schooner is ashore on sand-shoals near Smith Island, and two Italian and one Norwegian barks are ashore at Cape Henry.

April 8 *to* 10, 1877.—The storm was the most severe since 1846. All the regular steamships to New York, Baltimore, Richmond, and Washington, together with all sailing-vessels, remained in port. Several marine disasters are reported to have occurred in Chesapeake Bay. The ferry-boats were forced to suspend their trips to Portsmouth and Berkley. The tide, on the evening of the 9th, was the highest known in the city since 1846.

May 8, 1877.—Boston and Providence steamers remained in port.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	3,692
Number of Local Reports issued during the year ending June 30, 1877	833
Number of Form 15 (manifold) issued during the year ending June 30, 1877	3,701
Number of Form 22 issued during the year ending June 30, 1877	43
Total	8,269

NORTH PLATTE, NEBRASKA.

[*Official number*, 105.]

Latitude	41° 8′
Longitude	100° 53′
Mean barometer for the year ending June 30, 1877	29.616
Mean temperature for the year ending June 30, 1877	47°.4
Amount of rain-fall for the year ending June 30, 1877	15.68 inches.

Sergeant E. Garland was relieved July 21, 1876, for discharge, and relieved by Sergeant J. E. Mayhew assigned, who was relieved April 12, 1877, on account of ill health. Sergeant H. U. Jones was assigned April 12, 1877, and continues in charge. There is no assistant at this station.

No change has been made in location of office or instruments since last report. The station was inspected in December, 1876, and was found in a satisfactory condition.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	2,937
Number of Form 22 issued during the year ending June 30, 1877	26
Total	2,963

OLYMPIA, WASHINGTON TERRITORY.

[*Official number*, 148.]

Latitude	47° 2′
Longitude	122° 56′

Sergeant E. F. Kubel was ordered to establish a station at this point per Special Orders No. 62, May 21, 1877, with directions to commence reports July 1, 1877.

OMAHA, NEBRASKA.

[*Official number*, 67.]

Latitude	41° 16′
Longitude	96° 0′
Mean barometer for the year ending June 30, 1877	29.968
Mean temperature for the year ending June 30, 1877	48°.7
Amount of rain-fall for the year ending June 30, 1877	45.97 inches.

Sergeant Thomas Cleary was relieved December 6, 1876, for neglect of duty, and Sergeant F. P. Bayes placed in charge of station. The sergeant reports that considerable interest is felt by all classes of citizens, and that extracts from the reports are published in the morning papers. The station was inspected in October, 1876, in fair condition only. Some of the records were not up to date, and Sergeant Cleary was relieved and reduced to the rank of private for his neglect of duty.

High water in the Missouri River at this point occurred June 13, when the gauge-reading was 17 feet 5 inches. The lowest water occurred on December 2, 3, and 4, when the readings were 1 foot 7 inches.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	4,908
Number of Form 22 issued during the year ending June 30, 1877	37
Total	4,945

OSWEGO, NEW YORK.

[*Official number*, 31.]

Latitude	43° 28′ 32″
Longitude	76° 35′ 5″
Mean barometer for the year ending June 30, 1877	29.999
Mean temperature for the year ending June 30, 1877	45°.6
Amount of rain-fall for the year ending June 30, 1877	27.40 inches.

Sergeant B. F. Hough was relieved by Sergeant R. J. Lewis and transferred April 16, 1877, to Santa Fé, N. Mex. Sergeant Lewis remains in charge and has no assistant.

The station was inspected in December, 1876, and June, 1877, and was found in good condition.

There has been no change in location of office or instruments during the year.

The following extracts are made from the semi-annual reports of the sergeant:

The people of this city take great interest in the service, and our reports are consulted by them in general. The class of people who receive the most benefit from the service in this immediate vicinity are vessel and canal-boat owners, and the men employed by them.

Shippers and commission-merchants, by canal, were much benefited this fall by the Signal Service. Many of them would have closed their business two weeks before the canal was frozen over only for the information they received from the office assuring them, from time to time, that the canal would remain open. Consequently they pushed their produce forward to New York City.

The schooner O. M. Bond, loaded with lumber from Canada, arrived in port on April 19, 1877, being the first arrival of the season.

Twenty-four cautionary signals were displayed during the year, of which number eight are reported as justified at station, and sixteen not justified.

The sergeant remarks as follows in regard to some of these displays:

July 5 and 6, 1876.—Four scows loaded with stone at the new piers were dashed to pieces and lost.

September 27 and 28, 1876.—Many vessels were detained; those which left were compelled to return.

October 2 to 4, 1876.—A number of vessels remained in port. One tug with two barges in tow left before signal was lowered; had to return on account of heavy sea.

October 5 to 7, 1876.—Several vessels were detained in port.

November 2 and 3, 1876.—Vessels bound west remained in. Several vessel-captains visited the office.

November 14 *and* 15, 1876.—Captain Way, of the schooner Enterprise, reports that he was caught in the gale on his way to this port, and that the wind was variable, "puffy," and so severe that he lost his jib, and had it not been for the tug C. P. Marcy, which came to his assistance, some six miles out, he could not have reached port. No vessels left port.

December 8 to 10, 1876.—Navigation closed for the season.

June 5 to 7, 1877.—Three vessels were detained.

June 9 and 10, 1877.—A number of captains called at the office; four vessels remained in port.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877 ..	5,679
Number of Local Reports issued during the year ending June 30, 1877.....	626
Number of Form 15 (manifold) issued during the year ending June 30, 1877...	2,916
Number of Form 22 issued during the year ending June 30, 1877.....	35
Total	9,256

PEMBINA, DAKOTA TERRITORY.

[*Official number*, 86.]

Latitude.....	49° 0′
Longitude.....	97° 5′
Mean barometer for the year ending June 30, 1877.....	29.968
Mean temperature for the year ending June 30, 1877.....	32°.9
Amount of rain-fall for the year ending June 30, 1877.....	29.46 inches.

Sergeant Charles Dill was relieved August 2, 1876, for discharge, and Sergeant J. Kabernagle placed in charge of station.

No change has been made in the location of office or instruments since last report, with the exception of the erection of a telescopic anemometer rod, upon which the anemometer is now secured.

The following extracts are made from the semi-annual reports of the sergeant:

Ice in Red River broke up and moved out at 3 p. m., April 19, 1877, and at 10 p. m. river was clear of ice.

The Red River Transportation Company's steamer Manitoba arrived at 2 a. m., April 23, 1877, being the first steamer of the season to arrive.

The station was inspected in September, 1876, and found in good condition.

PHILADELPHIA, PENNSYLVANIA.

[*Official number*, 17.]

Latitude.....	39° 57′
Longitude.....	75° 10′
Mean barometer for the year ending June 30, 1877.....	30.023
Mean temperature for the year ending June 30, 1877.....	52.0
Amount of rain-fall for the year ending June 30, 1877	41.07 inches.

Sergeant F. M. M. Beall remains in charge of this station since last report. One assistant was relieved for promotion, two were transferred to this station, and two were assigned to duty at the Centennial Exposition. The present force consists of the sergeant and two assistants. A civilian printer has been employed since April 6, 1877. The work of this station is very great, and the fact that it is satisfactorily and

promptly attended to, with such a small force, reflects great credit on Sergeant Beall.

The office was inspected in November, 1876, and was found in good condition.

There has been no change in the location of the office since the last report.

The following extracts are made from the semi-annual report of the sergeant:

The use of a room for the office is given free of rent by the Commercial Exchange, and is suitable for the proper performance of our duties.

The board of health continue to publish a full weekly report of our local observations, and a handsome yearly statement occupying sixty pages.

By request, the Philadelphia Local Telegraph Company is furnished a copy of the morning "Indications," and the data for the Middle States is sent over their lines, and received in all parts of the city on their numerous printing instruments.

The labors of the Signal-Service continue to be received by the public with the usual unquestionable confidence.

The duty of receiving reports of passing vessels at Cape May, since May 30, and furnishing them to the Maritime Exchange folks, has given satisfaction and sometimes valuable information.

During the winter season shippers and dealers in meats, oysters, fruits, vegetables, &c., use our reports to great advantage, using the temperature principally.

The press of the city continue to act in the most favorable manner toward the service, and by supplying them with the usual press reports and often special reports of any unusual phenomena, they have gradually learned to depend on this office for their local weather reports almost entirely, instead of getting them from private observers, as frequently done before.

During the past six months our records were required in court twice, and data furnished attorneys five times to be used.

On August 1, 1876, the issue of printed weather maps was discontinued by order of the Chief-Signal Officer.

Eight hundred and seventeen post-offices are supplied from this station with the Farmers' Bulletin.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1877	255,821
Number of Bulletins (manifold) issued during the year ending June 30, 1877	6,825
Number of Maps issued during the year ending June 30, 1877	3,900
Number of Local Reports issued during the year ending June 30, 1877	2,752
Number of Form 15 (manifold) issued during the year ending June 30, 1877	5,824
Number of Form 22 issued during the year ending June 30, 1877	384
Total	275,506

PIKE'S PEAK, COLORADO.

[*Official number*, 99.]

Latitude	38° 48′
Longitude	104° 59′
Mean barometer for the year ending June 30, 1877	29.959
Mean temperature for the year ending June 30, 1877	19°.2
Amount of rain-fall for the year ending June 30, 1877	25.13 inches

Sergeant C. M. Hobbs remains in charge of station during the year. An order was issued June 30, 1877, relieving him and assigning Sergeant William Black to the station. There is one assistant on duty at the summit and one at the supply station at Colorado Springs. No change has been made in the location of the office or instruments during the year. The station was inspected in December, 1876, and the inspector reports that it was in fair condition.

The following extracts are made from the abstract of monthly journal of the sergeant:

August 18, 1876.—A curious electrical phenomenon was observed this evening. At twilight a peculiar singing or sizzing noise on the wire was heard, and the line, for an eighth of a mile, was distinctly outlined in light, which was thrown out from the wire in beautiful scintillations. These little jets of flame were invariably in the shape of a quadrant, and the rays concentrated at the surface of the line in a small mass about the size of a currant, which had a bluish tinge. These little quadrants of light were continually jumping from point to point, now pointing in one direction and then in another. There was no heat to the light, and when the wire was touched only the slightest tingling sensation could be felt. Not only was the wire outlined in this manner, but every exposed metallic point and surface was similarly tipped and covered. The cups of the anemometer appeared as four balls of fire revolving slowly around a center; the wind-vane was outlined with the same phosphorescent light. At the time of the occurrence snow was falling, and it has been observed that the singing noise is never heard except when the atmosphere is very damp, and rain, hail, or snow is falling.

September 12, 1876.—Water has become so scarce on the mountain that it is necessary to carry it a mile up the mountain-side, and sometimes two miles.

November 23, 1876.—The wind reached a maximum velocity of 83 miles at 1.15 a. m.

November 29, 1876.—Wind has ranged from 50 to 70 miles per hour since noon. The sky has been nearly clear of clouds, but the snow has been drifting so violently as to almost completely obscure the view in all directions.

December 29, 1876.—A heavy storm commenced some time after midnight, which shook the house violently, and the roar of the wind was terrific. One anemometer was carried away, two of the doors of the instrument-shelter were blown off their hinges, and a third forced half-way into the shelter. The velocity of the wind is estimated to have been between 90 and 100 miles per hour. The storm rapidly diminished after day-break.

January 8, 1877.—One of the heaviest storms ever witnessed at the station occurred to-day. It is estimated that the wind exceeded a velocity of upward of 100 miles per hour, although the anemometer only recorded 80 miles per hour, but its cups were continually clogged with drifting snow, much impeding its movement, and in consequence it had to be changed about once an hour. The temperature throughout was very low. During the storm, Sergeant Hobbs arrived near the summit, from Colorado Springs, in an almost exhausted condition. Private Greenwell went to his assistance, and after much difficulty they both arrived at the house on the summit, Sergeant Hobbs with his fingers badly frozen.

February 26, 1877.—The heaviest frost I have ever observed formed last night, it being 3 inches thick in some places on the poles and on the house, and that which was collected in the gauge, when melted, measured .20 of an inch. It collected on the telegraph-wire nearly to the thickness of one's arm.

April 21, 1877.—The wind steadily increased during the night and at day-break was blowing a hurricane from the southwest. At 8.30 a. m. it reached a velocity of 84 miles, and then its force commenced to decrease.

April 22, 1877.—The wind-velocity again rapidly increased during the night, and was blowing at the rate of 84 miles an hour at 6.30 a. m., after which it decreased.

June 7, 1877.—The most severe storm of the year, snow falling in immense quantities.

June 8, 1877.—Storm continued to rage violently throughout the entire day. The largest quantity of snow fell during the year.

PIOCHE, NEVADA.

[*Official number*, 140.]

Latitude	37° 57′
Longitude	114° 26′

Corporal H. Hall was ordered to establish a station at this point, per Special Orders No. 62, May 21, 1877, and to commence observations on July 1, 1877.

PITTSBURGH, PENNSYLVANIA.

[*Official number*, 41.]

Latitude	40° 32′
Longitude	80° 2′
Mean barometer for the year ending June 30, 1877	29.993
Mean temperature for the year ending June 30, 1877	51°.0
Amount of rain-fall for the year ending June 30, 1877	37.74 inches.

Sergeant J. Mitchell was relieved by Sergeant G. W. Hay and transferred November 23, 1876, to Office Chief Signal-Officer. Sergeant Hay continues in charge and has given satisfaction.

Two assistants were, during the year, transferred to other stations, and one assigned to duty here.

A civilian printer has been employed at this station since May 1, 1877.

The station was inspected in February, 1877, and found in good condition, although the rooms occupied are not well adapted to the purpose.

Three hundred and twelve post-offices have been supplied with the Farmers' Bulletin from this station.

High water in the Monongahela, at this point, occurred July 17, 1876, when the gauge-reading was 22 feet 1 inch; and low water on the 3d and 5th of September, 1876, when the reading on gauge was 2 inches; this was one inch below low-water mark of September 19, 1874.

The following extracts are made from the semi-annual reports of the sergeant:

The press of the city manifest considerable interest.

The class of citizens deriving the greatest amount of benefit from the reports are probably those engaged in the river trade. The river reports are of great interest and benefit to them.

The grain dealers of this city manifest a lively interest in the reports from the West at certain portions of the year.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1877	103,304
Number of Bulletins (manifold) issued during the year ending June 30, 1877	6,441
Number of Local Reports issued during the year ending June 30, 1877	774
Number of Form 22 issued during the year ending June 30, 1877	173
Number of Form 26 issued during the year ending June 30, 1877	2,376
Total	113,068

PORT HURON, MICHIGAN.

[*Official number*, 103.]

Latitude	42° 58′
Longitude	82° 29′
Mean barometer for the year ending June 30, 1877	29.986
Mean temperature for the year ending June 30, 1877	43°.9
Amount of rain-fall during the year ending June 30, 1877	33.25 inches.

Sergeant N. D. Lane was relieved by Sergeant H. R. Stockman, August 4, 1876, and ordered to office Chief Signal-Officer for discharge. There is one assistant on duty here. The office was inspected and found in a satisfactory condition. In the location of office and instruments there has been no change since the last report.

The following extracts are made from the semi-annual reports of the sergeant:

The interest in the service is manifested to the greatest degree by mariners, and apparently is continually increasing.

First signal of the season, March 31. Ice entirely disappeared May 21. Sunset observations began February 7. Very severe frost June 23. Navigation partially opened April 18, and fully on the 15th of May. First vessel of the season arrived up April 18, but was blocked in ice until 23d.

April 30, 1877.—All marine men state, for a remarkable and hitherto unheard of fact, that all ice has disappeared, and left the Straits of Mackinaw open for navigation, while the mouth of Saint Clair River and this end of Lake Huron remain blocked.

May 21, 1877.—The lake and river are at last free from ice, which has remained remarkably later than usual.

Twenty-nine cautionary signals were displayed during the year, of which number fifteen are reported as justified at station, and fourteen not justified.

The sergeant remarks as follows in regard to some of these displays:

August 25, 1876.—The newspapers report a very heavy rain-storm, accompanied by high winds and intense lightning, in the adjoining counties, and great damage to property and some loss of life.

September 4, 1876.—The barge Port Huron, loaded with pig-iron, was sunk about 12 miles northwest of station.

September 17 *and* 18, 1876.—Barkentine George Thurston beached on the Canadian shore of Lake Huron.

September 26, 1876.—Vessels anchored in port.

October 2 *and* 3, 1876.—The scow Mary Jane, with some persons aboard, supposed to have been wrecked near Kettle Point, and all hands lost.

October 5 *to* 7, 1876.—The bark Acorn was sunk. Schooner Lottie Wolf had all her canvass blown away, and numerous other vessels suffered more or less damage, &c.

October 9 *and* 10, 1876.—Casualties—Ashore, steam-barge Nahan, schoonors J.R. Bently, C. K. Nims, and one unknown. Dismasted, schooner Erie Belle. Canvass split and spars lost, schooners Lucerne, Algerine, and David Stewart.

November 6 *and* 7, 1876.—The schooners Emma Coines, Annie Sherwood, Thomas Gaun, Melvin Baker, and five others came to anchor in port, and remained until signal was lowered.

November 22, 1876.—Two schooners remained in port.

April 29, 1877.—The ice was loosened, thereby releasing the blockaded vessels.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877 ..	2,060
Number of Local Reports issued during the year ending June 30, 1877	293
Number of Form 22 issued during the year ending June 30, 1877	45
Total	2,398

PORTLAND, MAINE.

[*Official number*, 12.]

Latitude	43° 40′
Longitude	70° 16′
Mean barometer for the year ending June 30, 1877	29.945
Mean temperature for the year ending June 30, 1877	46°.9
Amount of rain-fall for the year ending June 30, 1877	34.82 inches.

Sergeant W. T. Boyd was discharged and re-enlisted at Portland, Me., November 3, 1876, and reassigned to station on the same date. One assistant was discharged during the year for misconduct, and replaced by another assistant. The station was inspected in July, 1876, and May, 1877, and was found in good condition. The station-work is well attended to. No change has been made in the location of office or instruments since last report. An inside addition of lattice-work was made to the instrument-shelter June 6, 1877.

The following extracts are made from the semi-annual reports of the sergeant:

Cautionary signals are displayed from the staff on the custom-house, and afford an excellent display to all vessels in the harbor, and also to those at a considerable distance outside the bay.

The observer has been called upon to give testimony in the supreme court several times during the past six months, in regard to the weather at different times, and in two cases (Stewart *vs.* City of Portland and Parker *vs.* Portland Press) the evidence given was considered decisive.

The same interest in the service continues as at former reports.

Forty-three cautionary signals have been displayed during the year, of which number twenty are reported as justified at the station, and twenty-three not justified.

The sergeant remarks as follows in reference to some of these displays:

July 28 and 29, 1876.—All sailing vessels came into harbor.

September 17 and 18, 1876.—Coasters report a very high and dangerous wind, with a rough sea, outside the cape.

November 6 to 8, 1876.—All sailing-vessels anchored inside the bay.

November 19 to 22, 1876.—All vessels remained in the harbor. A few minor casualties occurred. The storm was very severe and heavy outside the bay; the waves could be seen dashing over Green Island.

December 9 and 10, 1876.—A gale accompanied by snow; the weather extremely cold. The signal gave timely warning, and, although the storm was very severe, but little damage was done. All the steamers delayed their trips, except the Polynesian of the Allen line, the captain of which stated that they always sailed on the day set.

December 16 and 17, 1876.—This is reported as the most severe gale for years. The English steamer Sardinian sailed in the face of the gale. All sailing crafts kept the harbor. No casualties to shipping in this vicinity. A dory was capsized in the harbor, with four men on board, who are supposed to be lost. A great amount of local damage was done, such as unroofing houses, blowing down chimneys, signs, &c.; several persons were injured.

December 18 and 19, 1876.—The gale was accompanied by a cold, driving snow, which delayed the railroad trains. One vessel in harbor had her smoke-stack blown off, and one dragged anchor and went ashore. A large brick church (unfinished) was demolished, and a large brick house, on Peak's Island, was unroofed and had gable blown in.

December 29 to 31, 1876.—Gale was accompanied by blinding snow and sleet. The fishing fleet, about twenty sail, was out on Jefferies Bank, and had a rough time. Some of the vessels were driven ashore; some lost sails and rigging; three men were washed overboard and lost.

January 24 to 25, 1877.—All vessels remained in port. Storm signals are now strictly observed at this port.

March 2 and 3, 1877.—Regular line-steamers remained in port, delaying their regular trips. All sailing vessels remained in the bay.

March 8 to 10, 1877.—A very severe gale, accompanied by rain and snow. By the timely warning, all disasters in the vicinity were prevented. A number of minor accidents occurred in the city.

March 25 to 29, 1877.—Heavy rains and dense fog accompanied the gale. All vessels remained in the bay. No damage to shipping. Considerable damage is reported throughout the State from freshets and ice-jams, caused by the heavy rains.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	3,250
Number of Form 15 (manifold) issued during the year ending June 30, 1877	2,028
Number of Form 22 issued during the year ending June 30, 1877	77
Total	5,355

PORTLAND, OREGON.

[*Official number, 74.*]

Latitude	45° 30′
Longitude	122° 27′ 30″
Mean barometer for the year ending June 30, 1877	30.079
Mean temperature for the year ending June 30, 1877	53°.9
Amount of rain-fall for the year ending June 30, 1877	52.40 inches.

Sergeant H. Fenton was relieved by Sergeant E. Lloyd September 8, 1876, and discharged the service at Portland Oreg., October 1, 1876. Sergeant Lloyd has continued in charge and has given satisfaction. The station was inspected in January, 1877, and found in fair condition. The inspector recommends that an assistant be sent to this station, and the recommendation will be carried out when practicable. The local reports are published in the daily papers.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1877	761
Number of Forms 22 issued during the year ending June 30, 1877	46
Total	807

PORTSMOUTH, NORTH CAROLINA.

[*Official number*, 137.]

Latitude	35° 2′
Longitude	76° 4′

Private J. E. Hayes was relieved May 10, 1877, by Private R. Strain, who remains in charge of station. The station has not been inspected since last report.

This is still continued as a repair-station, but meteorological observations are taken whenever the enlisted man in charge is not out on the telegraph line on repair-duty. The station is supplied with thermometer, hygrometer, wind-vane, anemometer, and rain-gauge; and the observations taken are those of temperature, humidity of the air, direction of the wind and state of weather, velocity of the wind, amount and kind of clouds, and amount and time of rain-fall. There is no barometer at the station. The observations taken are forwarded to the central office by mail, telegraphic communication therewith being interrupted in consequence of a portion of the telegraph-line having been washed away by the severe storms of September 17, 1876, and April 14, 1877.

On the 8th September, 1876, the office was connected with the main line by a loop, and telegraphic communication completed, but since the storm of the 16th of the same month, direct telegraphic communication has not been had with this station. Attempts were made during December, 1876, and January, 1877, to find and secure the cable across Ocracoke Inlet, which had been lost by the washing away of the shore during the storm of September, but without success; and work thereon was discontinued until the arrival of Lieutenant C. A. Booth, U. S. A., with a large working-party.

On the 14th of April, 1877, another severe storm visited this station, which completely submerged the island, doing much damage to property, and resulting in the death of nearly all the animals there, and is said by the inhabitants to have been the heaviest storm ever remembered by them.

On the 19th of May, 1877, the anemometer was placed in position, and after that date regular observations of the velocity of the wind were taken.

During parts of May and June the air was filled with dense smoke, occasioned by large fires raging in the woods on the main land.

PUNTA RASSA, FLORIDA.

[*Official number*, 59.]

Latitude	26° 36′
Longitude	82° 10′
Mean barometer for the year ending June 30, 1877	*30.061
Mean temperature for the year ending June 30, 1877	*72°.6
Amount of rain-fall for the year ending June 30, 1877	46.48 inches.

Sergeant F. J. Pabst was relieved February 6th, 1877, by Sergeant M. J. Shanefelter, who was relieved by Sergeant H. F. McFarland, April 12, and ordered to Key West, Fla.

Sergeant McFarland has frequently been sick since he was assigned to this station, and the work has not been satisfactorily attended to.

The station was inspected in May, 1877, and found in good condition.

* Only 30 days' observations in May, and 26 in June, 1877

RED BLUFF, CALIFORNIA.

[*Official number*, 143.]

Latitude	40° 10′
Longitude	122° 16′

Sergeant R. R. Rodgers was ordered to establish a station at this point, per S. O. No. 62, May 21, 1877, and to commence observations on July 1, 1877.

ROCHESTER, NEW YORK.

[*Official number*, 32.]

Latitude	43° 8′
Longitude	77° 51′
Mean barometer for the year ending June 30, 1877	29.972
Mean temperature for the year ending June 30, 1877	46°.5
Amount of rain-fall for the year ending June 30, 1877	29.53 inches.

Sergeant L. E. Sebree was relieved and ordered to office Chief Signal-Officer for discharge, February 12, 1877. Sergeant E. B. Garriott was temporarily assigned to this station August 12, 1876; was transferred November 3, 1876, to Buffalo, N. Y., and February 12, 1877, was permanently assigned to this station. Sergeant J. O. Barnes, who had been on duty at this station as assistant, was relieved July 13, 1876. Private H. E. Williams was assigned to duty here on July 13, 1876. The station was inspected in December, 1876, and June, 1877, and found in excellent condition. The inspecting officer speaks in complimentary terms of the attention to duty and abilities of the sergeants who have been in charge of this station since last report.

The following extracts are made from the semi-annual reports of the sergeant:

The meteorological committee now consists of Messrs. George Schofield, John Siddons, and H. D. Hebard, the first-named gentleman being chairman of the committee. They are all prominent business men of this city, and take a lively interest in the workings of the service. A copy of the resolutions under which the committee was established on a permanent basis, with rules for the government and guidance of the committee, was received at this office May 1, 1877.

Mr. J. A. Mulligan, telegraph operator at Charlotte, is notified over the wire when the signals are ordered up or down. This notification is no expense to any one, and is done through the courtesy of the Western Union employés at this place.

The press of this city gives the service its heartiest support, and a generous amount of space is given to the reports in all of the papers published.

The reports posted, issued, and published at this place, are studied by all classes, and persons in all callings derive more or less benefit from them.

Mr. John Siddons, one of the members of the meteorological committee, is a metal and tin roofer, and galvanized iron cornice maker, and he states that he has often saved considerable sums of money by consulting the reports and indications, as in his business an unlooked for storm would sometimes do very serious damage.

The fruit-dealers and nurserymen, and handlers of perishable goods, derive great benefit from the temperature predictions.

This office is consulted almost daily by lawyers wishing to ascertain the state of the weather at certain times. This data is often presented in court and is always taken as conclusive.

The interest taken in the service seems to be continually increasing.

The Farmers' Bulletins, which have been received and posted here since the 9th day of March, 1877, have given greater satisfaction than the meager and sometimes incorrect "Indications" taken from the papers.

The steamer Norseman and a schooner arrived at Charlotte April 6, 1877, being the first arrivals of the season.

Twenty-four cautionary signals have been displayed during the year, of which number thirteen are reported as justified at the station, and

eleven not justified. The sergeant remarks as follows in reference to some of these displays:

October 2 *to* 4, 1876.—The steamer Norseman failed to arrive—laid up on the other side. Several vessels left the port of Charlotte, but were obliged to return on account of encountering the gale.

October 5 *to* 7, 1876.—Steamer Norseman left, but was obliged to return; reports very heavy weather outside.

October 14, 1876.—Several vessels left port, but were obliged to return. The scow Live Oak, loaded with coal, was sunk near the mouth of the river.

November 2 *and* 3, 1876.—Steamer Norseman left, but was compelled to return to harbor. One propeller, bound up the lake, ran in for shelter.

December 8 *to* 10, 1876.—The weather intensely cold, with a blinding snow-storm. Some damage was done to property in the vicinity of station. No marine disasters occurred, as navigation is closed for the season.

December 14 *to* 16, 1876.—The most severe storm of the season. Many buildings unroofed, among which was Saint Mary Hospital and three blocks of houses, a chimney at the jail was blown down and destroyed a portion of the roof. So much ice was blown from the lake on to the tracks of the Buffalo and Niagara Falls Railroad as to completely stop traffic. The trains on the Central Railroad were also delayed. Much other damage was done.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	5,174
Number of Local Reports issued during the year ending June 30, 1877	927
Number of Form 15 (manifold) issued during the year ending June 30, 1877	1,926
Number of Form 22 issued during the year ending June 30, 1877	127
Total	8,154

ROSEBURG, OREGON.

[*Official number*, 146.]

Latitude	43° 10′
Longitude	123° 16′

Sergeant J. Dascomb was ordered to establish a station at this point, per Special Orders, No. 62, May 21, 1877, and to commence reports July 1, 1877.

SACRAMENTO, CALIFORNIA.

[*Official number*, 144.]

Latitude	38° 35′
Longitude	121° 31′

Sergeant R. B. Watkins was ordered to establish a station at this point, per Special Orders No. 62, May 21, 1877, and to commence observations July 1, 1877.

SALT LAKE CITY, UTAH TERRITORY.

[*Official number*, 70.]

Latitude	41° 10′
Longitude	112° 00′
Mean barometer for the year ending June 30, 1877	29.958
Mean temperature for the year ending June 30, 1877	51°.4
Amount of rain-fall for the year ending June 30, 1877	18.66 inches.

No change has been made in location of office or instruments since last report. Sergeant William McGillivray has remained in charge of station since last report. There is no assistant on duty at this station.

The station was inspected in December, 1876, and found in good condition.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877 ..	2,258
Number of Local Reports issued during the year ending June 30, 1877	319
Number of Form 22 issued during the year ending June 30, 1877.....	61
Total	2,636

SAN DIEGO, CALIFORNIA.

[*Official number*, 75.]

Latitude	32° 44′ 41″
Longitude.....	117° 8′ 0″.
Mean barometer for the year ending June 30, 1877.....	30.007
Mean temperature for the year ending June 30, 1877	61°.9
Amount of rain-fall for the year ending June 30, 1877.....	3.80 inches.

Sergeant John B. Wells was discharged August 18, 1876. Private C. Edward Howgate was promoted corporal August 16, 1876, and placed in charge of station. Corporal Howgate was promoted to sergeant March 14, 1877, and on June 16, 1877, was transferred to Los Angeles, Cal., relieving Sergeant M. M. Sickler, who was assigned to the San Diego station. The work of the station has been satisfactorily performed. No changes have been made in location of office or position of instruments since last report. No assistant has been on duty at this station, all duty being performed by the sergeant. The following extract is made from the semi-annual report of the sergeant:

The daily papers published local reports and monthly means (Form 22) in a very complete manner.

The station was inspected in January, 1877, and found in excellent condition.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1877.....	816
Number of Form 22 issued during the year ending June 30, 1877.....	22
Total	838

SANDY HOOK, NEW JERSEY.

[*Official number*, 112.]

Latitude	40° 28′
Longitude	74° 1′
Mean barometer for the year ending June 30, 1877.....	29.992
Mean temperature for the year ending June 30, 1877	51°.5
Amount of rain-fall for the year ending June 30, 1877 .....51.35 inches.	

Sergeant William McElroy was relieved and ordered, July 6, 1876, to Fort Whipple, Virginia, for additional instruction, and Sergeant I. T. Shadle placed in charge of station. Sergeant Shadle was transferred April 24, 1877, to San Antonio, Tex., and Private P. J. Huneke placed in charge. He has one assistant. During the year, two assistants have been relieved and assigned to other stations. No change has been made in location of the office or instruments since the date of last report. The following extracts are made from the semi-annual reports of the sergeant:

January 7, 1877.—The steamship L'Amerique, with fifty-four passengers and a crew of one hundred and sixty men, bound from Havre to New York, came ashore at 2 a. m., at Seabright, during dense fog, heavy rain and strong sea running at the time. Life-

saving crew of Nos. 3 and 4 were soon on hand and worked faithfully. Three of the L'Amerique's crew were lost by the capsizing of their boat. The passengers and part of the crew were landed safely with the life-car; cargo and ship saved. All assistance in the power of this station was rendered.

Sergeant Shadle, in charge of the sea-coast station at Sandy Hook, was at Seabright—near which place the ship struck—on duty connected with the sea-coast line, at the time the steamer L'Amerique went ashore, and opened telegraphic communication with this office from that point reporting the disaster.

Sergeant Shadle remained at this temporary station during the next day and night, and transmitted all messages presented by persons connected with the L'Amerique to Sandy Hook, where they were transferred to the Maritime Association Telegraph Line of New York. Six messages were transmitted from the vessel to New York and six received from persons connected with the steamer.

As evidence of the importance of careful organization and good discipline at the sea-coast stations, it is reported that offers of pecuniary reward have in some instances been made to non-commissioned officers, conditional upon the delaying of the announcement of disasters. It is not believed that offers of this kind have ever been accepted.

Seventy cautionary signals were displayed at this station during the year, of which number fifty-one are reported as justified at station, and nineteen not justified.

The sergeant remarks as follows in reference to some of these displays:

September 16 *to* 19, 1876.—This storm is said to have been the most severe and destructive known along the coast for thirty years; its work of destruction can be seen all along the coast from Sandy Hook to Barnegat Inlet.

October 20 *to* 22, 1876.—Four captains of vessels called at the office; they decided to remain in the harbor.

November 18 *to* 21, 1876.—Coast steamers anchored in the bay. The New Jersey Southern Railroad and the telegraph-lines were washed away at the Highlands, six miles south of station. Heavy rain accompanied the storm, and at times dense fog. Part of the beach was washed away.

December 8 *to* 10, 1876.—Three-masted schooner Herschel, unloading coal at railroad dock, was blown ashore. Coast Survey schooner Hayes was blown ashore at the same place; was towed off by tugs. Tug Mary B. Curtis, with dredging-machine in tow, went ashore, inside of the bay, about 600 yards from station. Steamship California, of the Anchor Line, from New York to Glasgow, ran ashore in Swash Channel; will get off at high water. The fence around the station was leveled to the ground. Fine clay collected on the glasses of the light-house, which must have been blown across the bay, as none like it can be found nearer that could be blown there by a westerly wind.

January 8 *and* 9, 1877.—A schooner went ashore on Roman Shoals; was taken off by tugs in the morning.

March 17 *to* 19, 1877.—The steamship Rusland came ashore at Long Branch during the night; passengers and crew all saved. It is reported that the vessel is going to pieces.

April 8 *to* 10, 1877.—Steamship Rusland ashore at Long Branch; broke in two and is a total loss. The steamship Amérique ashore at Seabright; got off and was towed to New York.

April 13 *and* 14, 1877.—Steamship Georgia remained in the bay until 5 p. m. on account of signal.

April 28 *to* 30, 1877.—Sailing-vessels remained in bay. Storm was accompanied by rain and fog, rendering navigation near the coast dangerous.

May 2 *to* 4, 1877.—Sailing-vessels remained in the bay.

May 8 *and* 9, 1877.—Sailing-vessels remained in the bay.

May 10, 1877.—None but fishing-boats left the bay, and they not until the wind changed to northwest.

June 5 *to* 7, 1877.—Sailing-vessels remained at anchor in the bay.

June 30 *to July* 2, 1877.—A severe squall on the 1st instant, lasting only a few minutes, accompanied by thunder and lightning, heavy rain and some hail; some minor damages done in the vicinity. No damage done to shipping as far as known. A boat belonging to the East Beacon light-house was taken up out of the water and carried a considerable distance on shore.

During the storm of September 17, 1876, the north head of Barnegat Inlet was washed away for some distance, and width of inlet increased, and the end of cable was lost. Every effort was made to find it, but without success. The cable was underrun from the south side of the

inlet until within five hundred yards of the north side. The cable was so deeply imbedded in sand that no more could be recovered. A splice was made April 13, 1877, and direct telegraphic communication with Office Chief Signal-Officer resumed. A temporary station was established on north side of Barnegat Inlet January 13, 1877, and communication opened, and all meteorological and other reports transmitted by flag and torch until the cable was in working order. A new cautionary-signal lantern has been prepared for this station, and consists essentially of six locomotive head-lights. Its use will commence July 1, 1877. The light can be seen a long distance at sea and all over the bay. The sergeant reports that the light gives great satisfaction to shippers.

The station was inspected in April, 1877, and was found in fair condition; all books and records up to date.

SAN FRANCISCO, CALIFORNIA.

[*Official number*, 29.]

Latitude	37° 47′ 35″
Longitude	122° 26′ 15″
Mean barometer for the year ending June 30, 1877	30.007
Mean temperature for the year ending June 30, 1877	57°.1
Amount of rain-fall for the year ending June 30, 1877	11.04 inches.

Sergeant S. W. Beall has continued in charge of station since last report, and has one assistant. Private E. W. Nelson was temporarily assigned to station March 16, 1877, while en route to Saint Michaels, Alaska, and remained on duty until April 25, 1877. The station was inspected in January, 1877, and was found in good condition.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	2,236
Number of Local Reports issued during the year ending June 30, 1877	1,055
Number of Form 22 issued during the year ending June 30, 1877	97
Total	3,388

SANTA FÉ, NEW MEXICO.

[*Official number*, 69.]

Latitude	35° 41′
Longitude	106° 10′
Mean barometer for the year ending June 30, 1877	*29.804
Mean temperature for the year ending June 30, 1877	*48°.3
Amount of rain-fall for the year ending June 30, 1877	14.79 inches.

Sergeant J. F. Burke was discharged May 10, 1877, for drunkenness and neglect of duty. Sergeant B. F. Hough was assigned to station April 16, 1877. There is no assistant on duty at this station. The office has not been inspected since last report.

Sergeant J. F. Burke was placed in arrest March 20, 1877, by order of General Edward Hatch, for drunkenness, and Sergeant Frost was placed in charge of station until the arrival of Sergeant B. F. Hough.

No change has been made in location of office or instruments since last report.

The local reports are published in the daily New Mexican.

* Only 29 days' observations in March, 1877.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1877	316
Number of Form 22 issued during the year ending June 30, 1877	13
Total	329

SAVANNAH, GEORGIA.

[*Official number*, 22.]

Latitude	32° 5′
Longitude	81° 8′
Mean barometer for the year ending June 30, 1877	30.071
Mean temperature for the year ending June 30, 1877	66° .6
Amount of rain-fall for the year ending June 30, 1877	58.73 inches.

Sergeant H. R. Stockman was relieved July 5, 1876, for neglect of duty, and Sergeant J. H. Garrard assigned to station. Sergeant Garrard remained in charge until October 12, 1876, when he died of yellow fever.

Private Ira W. Birt died of yellow fever October 9, 1876.

Mr. A. K. Sinnot (civilian) took charge of station October 5, 1876, on account of sickness and death of Sergeant Garrard and Private Birt, and remained in charge until November 23, 1876, when he was relieved by Sergeant W. S. Popple, who remained in charge of station until arrival of Sergeant Rohe, November 23, 1876.

Sergeant G. A. Rohe was relieved February 6, 1877, and discharged the service, at his own request, February 20, 1877.

Private H. White was transferred to this station December 11, 1876.

Sergeant J. T. Downes was assigned to station February 6, 1877, and remains in charge, and has given satisfaction.

The station was inspected in June, 1877, and was found in excellent condition.

No change has been made in location of office or instruments since last report.

Seventeen cautionary signals have been displayed during the year, of which number seven are reported as justified at station, and ten not justified. The sergeant remarks as follows in regard to some of these displays:

September 16 *and* 17, 1876.—The gale only lasted about thirty minutes at this station; it was very severe at Tybee Roads, the entrance to port. During the display the office was visited by rice-planters, shippers, and captains, anxious for information in regard to the anticipated storm. Captain Burnett, of the Spanish brig Olympia, lying at Tybee Roads, telegraphed to his mate to "prepare for bad weather," and expressed the utmost confidence in the warning. No disasters reported.

December 24 *and* 25, 1876.—The steamer City Point, bound for Charleston, remained in port, although advertised to leave. Steamship George Appold, for Providence, R. I., left her wharf, but anchored in Tybee Roads.

March 17 *and* 18, 1877.—The captain of the steamer Saragossa reports having encountered rough weather off Capes Hatteras and Lookout on 16th instant.

April 8 *and* 9, 1877.—Schooners Mary Potter, Paragon, and Earnest (eastern vessels) remained in port. Railroads badly washed.

April 12 *to* 14, 1877.—Schooners Lizzie Lane, the Palmer, and Addie Fuller, remained in port. Much damage to early crops; also to the Charleston and Savannah Railroad.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 187	4,428
Number of Local Reports issued during the year ending June 30, 1877	1867
Number of Form 22 issued during the year ending June 30, 1877	31
Total	4,645

SHREVEPORT, LOUISIANA.

[*Official number*, 72.]

Latitude	32° 30′
Longitude	93° 45
Mean barometer for the year ending June 30, 1877	30.100
Mean temperature for the year ending June 30, 1877	64°.5
Amount of rain-fall for the year ending June 30, 1877	33.90 inches.

Sergeant P. J. Huneke was relieved July 13, 1876, for neglect of duty and drunkenness, and reduced to the rank of private. Sergeant J. B. Campbell was assigned to station July 13, 1876; was ordered April 3, 1877, to Fort Whipple, Virginia, for discharge, and upon re-enlistment was reassigned to station, April 20, 1877. Private P. C. Guthrie was on temporary duty from April 3 until April 20, 1877, during the absence of Sergeant Campbell. There has been no change in location of the office or instruments since last report.

The following extracts are made from the semi-annual reports of the sergeant:

> Local reports have been published in the Daily Times with great regularity.
>
> The members of the cotton exchange express themselves as being highly pleased with the beneficial results of the meteorological reports, and hope for a continuance of the same.

High water occurred July 28, 1877, when the gauge-reading was 29 feet 5 inches, and low water on November 13, 1876, when the reading was 2 feet 8 inches.

PUBLICATIONS.

Number of Local Reports issued during the year ending June 30, 1877	664
Number of Form 22 issued during the year ending June 30, 1877	45
Number of Form 26 issued during the year ending June 30, 1877	1,842
Total	2,551

SAINT LOUIS, MISSOURI.

[*Official number*, 66.]

Latitude	38° 37′ 28″
Longitude	90° 15′ 16″
Mean barometer for the year ending June 30, 1877	*30.036
Mean temperature for the year ending June 30, 1877	*54°.2
Amount of rain-fall for the year ending June 30, 1877	42.33 inches.

Sergeant George Prender was relieved August 14, 1876, and ordered to Office of Chief Signal-Officer for discharge. Sergeant William Finn was placed in charge of station August 14, 1876. During the year one assistant was relieved for promotion and one transferred to another station. Three hundred and eighty post-offices have been regularly supplied with Farmers' Bulletins from this station. The station was inspected October 26, 1876. The inspecting-officer reports that the condition of the office was much improved since the last inspection.

High water in the Mississippi at this station occurred July 7, 1876, when the gauge-reading was 30 feet 1 inch, and low water December 9, 1876, when it was 6 feet 9 inches.

The following extracts are made from the semi-annual reports of the sergeant:

> A meteorological committee was appointed by the Merchant's Exchange on January 30. This committee will prove of value to the service, as there is no occasion on

* Only 30 days' observations in May, 1877.

which they have been consulted that they have not shown a willingness to advance its interests.

The newspapers continue to publish reports as hitherto.

In educational matter the influence of the service has not been unfelt, as even the public schools are now taking steps in the direction of meteorological study, and teachers visit the office to learn the use of the instruments and working of the service, in some instances asking permission to bring their classes.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1877...	170,267
Number of Bulletins (manifold) issued during the year ending June 30, 1877..	6,606
Number of Maps issued during the year ending June 30, 1877.....	2,125
Number of Local Reports issued during the year ending June 30, 1877.....	2,261
Number of Forms 15 (manifold) issued during the year ending June 30, 1877..	1,116
Number of Forms 22 issued during the year ending June 30, 1877.....	333
Number of Forms 26 issued during the year ending June 30, 1877.....	2,820
Total	185,528

SAINT MARK'S, FLORIDA.

[*Official number*, 24.]

Latitude	30° 10′
Longitude.....	84° 12′
Mean barometer for the year ending June 30, 1877.....	30.069
Mean temperature for the year ending June 30, 1877.....	65°.0
Amount of rain-fall for the year ending June 30, 1877	64.38 inches.

Sergeant F. P. Bayes was relieved by Sergeant J. A. Cody and ordered to Office of the Chief Signal Officer, September 2, 1876, for discharge. Sergeant J. A. Cody continues in charge and renders all reports promptly.

Eleven cautionary signals have been displayed since last report, of which number five are reported as justified at station and six not justified. The sergeant remarks as follows in reference to some of these displays:

March 8 *and* 9, 1877.—Storm is reported to have been very severe on the coast. No casualties heard of.

May 6, 1877.—A tornado, doing considerable damage to property, such as throwing down houses, trees, fences, &c. Storm accompanied by rain and hail.

The station was inspected in June, 1877, and was found in good condition.

SAINT PAUL, MINNESOTA.

[*Official number*, 39.]

Latitude	44° 53′
Longitude.....	93° 5′
Mean barometer for the year ending June 30, 1877.....	*29.958
Mean temperature for the year ending June 30, 1877.....	*40°.5
Amount of rain-fall for the year ending June 30, 1877.....	*30.06 inches.

Sergeant W. O. Bailey was relieved July 13, 1876, for medical treatment, and Sergeant J. O. Barnes placed in charge of station. Sergeant M. J. Shanefelter was temporarily assigned November 8, 1876, during absence of Sergeant Barnes, and was transferred November 28, 1876, to Escanaba, Mich.

Corporal T. McCarty was assigned as assistant May 28, 1877.

High water in the river occurred on May 25 and 26, when the gauge-

* Mean of 11 months. No observations in July, 1877, observer sick, and only 28 days' observations in November, 1876.

reading was 7 feet 8 inches; low water occurred November 26, when the reading was 1 foot 1 inch.

The station was inspected in October, 1876, and was found in good condition.

The following extracts are made from the semi-annual reports of the sergeant:

Whatever interest has been manifested in this service at this station has not, I believe, changed since my last report.

The steamer Minneapolis arrived at 4.45 p. m., April 17, 1877, being the first boat of the season which came through from Saint Louis.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877 ..	4,513
Number of Form 22 issued during the year ending June 30, 1877	71
Total	4,584

SMITHVILLE, NORTH CAROLINA.

[*Official number*, 133.]

Latitude	33° 55′
Longitude	78° 1′
Mean barometer for the year ending June 30, 1877	30.061
Mean temperature for the year ending June 30, 1877	61°.7
Amount of rain-fal lfor the year ending June 30, 1877	61.53 inches.

Sergeant B. C. Anderson was transferred February 3, 1877, on account of ill-health, to Breckenridge, Minn., and Sergeant D. C. Ralston placed in charge of the station. Private W. U. Simons was relieved for discharge April, 1877, and replaced by Private A. A. Webb

The station has not been inspected since last report.

No changes have been made in the location of office or instruments at this station since last report. The following extracts are made from the semi-annual reports of the sergeant:

Of the storms during the past six months, that of April 13 was the severest. Five lives lost from this place alone by the loss of the pilot-boat Sprunt. Several vessels were lost in the immediate vicinity of this station, and a large amount of damage done to the property along the shore.

Great interest is shown in the service here, especially to the warning given of approaching storms by the display of the cautionary signal. Whenever a strong breeze springs up, pilots and steamboatmen are anxious to know if there is a likelihood of the signal being displayed, and whenever it is hoisted its warning is generally heeded.

Thirty-two cautionary signals were displayed at this station during the year, of which number fifteen are reported as justified at station and seventeen not justified.

The sergeant remarks as follows in reference to these displays:

August 1 *to* 3, 1876.—No vessels left this place.

September 16 *to* 18, 1876.—Several vessels driven ashore; but for the timely warning a brig would have undoubtedly gone ashore also.

November 27 *and* 28, 1876.—The English bark Ella Moore had her topmast and main-top-gallant mast carried away and came in disabled. Several vessels, among them the New York and Wilmington steamship, were unable to get to the bar in the face of the gale.

December 8 *to* 10, 1876.—The warning was heeded in the harbor; no damage done.

January 6 *and* 7, 1877.—A schooner went ashore by dragging anchor.

February 16, 1877.—It is reported that a vessel lost all three of her masts not far from here.

March 8 *and* 9, 1877.—The most severe storm of the season. Vessels in the road dragged their anchor, but no damage done.

April 12 *to* 14, 1877.—Severest storm for years. Two pilot-boats and seven schooners

driven ashore. Two pilot-boats, crew, all told, of twelve men, supposed to be lost. Light-ship drifted twenty-five miles from moorings.

April 19 *and* 20, 1877.—Steamer J. D. Foley, for Baltimore, anchored when signal was seen, and waited for the gale to blow over.

April 28 *and* 29, 1877.—Signal prevented the brig Dog and bark St. Olaf from leaving. Captains and pilots expressed their satisfaction at the timely warning.

June 21 *and* 22, 1877.—Numerous fishing-boats returned to main-land when the signal was displayed.

SPRINGFIELD, MASSACHUSETTS.

[*Official number*, 110.]

Latitude	42° 6′
Longitude	72°. 36′
Mean barometer for the year ending June 30, 1877	*29.980
Mean temperature for the year ending June 30, 1877	*49°.9
Amount of rain-fall for the year ending June 30, 1877	39.36 inches.

Sergeant Neill Dumont was discharged, at his own request, at Washington, January 30, 1877, while on furlough. Sergeant L. A. Welsh was assigned January 2, 1877, and has remained in charge and given satisfaction. One assistant was relieved during the year for neglect of duty. The assistant on duty at this station was relieved when the printing of Farmers' Bulletins was discontinued, since which time the sergeant has attended to the work without assistance. The station was ordered discontinued July 24, 1876, but the citizens offered to give the office rent-free for one year, provided the reports were continued. This was done, but the printing of Farmers' Bulletins was discontinued with the issue of July 31, 1877. The station has not been inspected since last report. No change has been made in location of office or instruments since last report.

The following extract is made from the semi-annual report of the sergeant:

The amount of public interest taken in the service at this point is indeed great, and the "indications," which are published in all the daily papers, are eagerly sought after and greatly appreciated. A tabular report of the observations made is furnished daily to the newspapers, and is regularly published.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1877	3,863
Number of Bulletins (manifold) issued during the year ending June 30, 1877	405
Number of Form 22 issued during the year ending June 30, 1877	8
Total	4,276

THATCHER'S ISLAND, MASSACHUSETTS.

[*Official number*, 125.]

Latitude	42° 36′
Longitude	70° 34′
Mean barometer for the year ending June 30, 1877	29.965
Mean temperature for the year ending June 30, 1877	46°.5
Amount of rain-fall for the year ending June 30, 1877	45.04 inches.

No change in office or in working force since last report. Corporal E. Davis continues to give satisfaction by his faithful attention to duty. The station was inspected in August, 1876, and was found in good order.

The telegraph-cable connecting the island with the main-land, al-

*Only thirty days' observations taken in August, 1876.

though in a very exposed position, has worked perfectly ever since it was laid in 1874, but the armor has become much worn by rubbing against the rocky bottom of the sea, and it may soon become necessary to renew the cable.

Forty-three cautionary signals have been displayed at this station since last report, of which number thirty are reported as justified at station and thirteen not justified.

The following remarks are made by Corporal Davis relative to the displays:

October 6 *and* 7, 1876.—Twelve vessels came into harbor when signal was hoisted.

October 21 *and* 22, 1876.—Dense fog prevailed. Schooner October, of Wiscasset, Me., lumber-laden, went ashore on Milk Island, one mile southwest of station, October 21, p. m.; vessel and cargo a total loss; no insurance; crew saved. A fishing-vessel passed island on 22d with a dismasted schooner in tow; name unknown.

November 19 *to* 22, 1876.—Twenty-five vessels in sight when signal was hoisted; all put for harbor. Two vessels dragged anchor and drove out of Gloucester Harbor into the bay on the 21st, but were picked up and towed into harbor.

December 15, 1876.—A small fishing-vessel belonging to Gloucester capsized and sunk six miles southwest of station. The crew was picked up by another vessel. Vessel valued at $1,000; insured $800.

December 29 *and* 30, 1876.—Thirty-six vessels in sight when the signal was hoisted. A few put to sea, but most of them made for harbor in safety.

January 15 *to* 17, 1877.—Forty-four vessels in sight when signal was hoisted, but a heavy snow-storm soon after prevented the observer from seeing if they heeded the warning.

March 13, 1877.—Storm came up very suddenly, catching a number of shore-fishermen out in their small boats, two of whom were drowned, and two others narrowly escaped with their lives; were picked up by another boat when nearly exhausted.

TOLEDO, OHIO.

[*Official number*, 35.]

Latitude	41° 40′
Longitude	83° 32′
Mean barometer for the year ending June 30, 1877	*29.9-5
Mean temperature for the year ending June 30, 1877	*49°.7
Amount of rain-fall for the year ending June 30, 1877	35.48 inches

Sergeant O. S. M. Cone remained in charge of station during the year. An order was issued June 30, 1877, transferring him to Mount Washington, N. H., and ordering Sergeant W. Line to this station. During the year one man was relieved for drunkenness and replaced by a competent and reliable assistant. The station was inspected in January, 1877, and found in good condition.

The following extracts are made from the semi-annual reports of the sergeant:

Navigation opened at this port on April 19, 1877, the schooner T. Y. Avery arriving on that date loaded with lumber from Alpena, Mich. The schooner Jno. Wesley sailed from this port on April 22, loaded with corn for Erie, Pa., being the first departure of the season.

This office was badly damaged by fire and water on February 17, 1877; most of the office-furniture and some of the records and stationery were destroyed. The instruments were all saved, except one water-thermometer, broken in removal, and the anemograph contact, which was burned. Only one observation was missed, viz, the 2 p. m. local, as the instruments were immediately put up in another room of the same building. The former office was completely repaired and refitted, and I occupied it on March 3, 1877.

Thirty-two cautionary signals were displayed at this station during the year, of which number nineteen are reported as justified at station and thirteen not justified. The following remarks are made relative to these displays:

July 27 *and* 28, 1876.—All sailing-vessels remained in port.

October 20 *to* 21, 1876.—All vessels remained in port.

* Only 27 days' observations in February, 1877.

March 21 *to April* 2, 1877.—Navigation not yet open. Several large signs and the tall iron smoke-stack on the principal hotel were blown down. One of the cups of the anemometer blown off.

April 7 *to* 10, 1877.—The fishermen suffered somewhat from the ice driven on the south shore of Lake Erie. Signs and fences blown down; an embankment of the Pennsylvania Railroad Company washed away at East Toledo.

April 19 *and* 20, 1877.—First vessel arrived this season on the 19th; first vessel sailed on 21st instant.

April 27 *to* 29, 1877.—All vessels remained in port.

May 5 *to* 8, 1877.—Sailing-vessels remained in port.

June 25, 1877.—Fences, signs, and trees were prostrated. One schooner had her top-sails blown to pieces. No lives lost.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	3,464
Number of Form 22 issued during the year ending 30, 1877	113
Total	3,577

TYBEE ISLAND, GEORGIA.

[*Official number*, 121.]

Latitude	32° 0′
Longitude	80° 52′
Mean barometer for the year ending June 30, 1877	*30.054
Mean temperature for the year ending June 30, 1877	*64°.2
Amount of rain-fall during the year ending June 30, 1877	68.41 inches.

No change has been made in the working force. Sergeant W. S. Popple remains in charge, and has given satisfaction. Sergeant Popple was taken sick October 7, 1876, and went to Savannah, Ga., for medical treatment, and remained absent until December 11, 1876, when he resumed charge of the station. During the time from October 7 until December 11, the observations were not regularly continued. A portion of the observations were taken and recorded by the telegraph operator at the station.

The station was inspected in June, 1877, and found in good condition.

No change has been made in location of office or instruments during the past year.

Nineteen cautionary signals were displayed during the year, of which number thirteen are reported as justified, and six not justified.

The sergeant reports as follows in reference to some of these displays:

November 23, 1876.—Observations suspended from this date. Observer sick with yellow-fever.

December 11, 1876.—Observations resumed.

December 17, 1876.—Steamer City Point put back on account of high sea and rough weather.

December 23 *to* 25, 1876.—The steamship George Appold, steamer City Point, and schooner Tarry Not, bound out, anchored in the Roads until the storm was over.

January 1 *and* 2, 1877.—No vessels left port.

UMATILLA, OREGON.

[*Official number*, 147.]

Latitude	45° 55
Longitude	119° 21′

Sergeant M. L. Hearne was ordered to establish a station at this point, per S. O. No. 62, May, 21, 1877, and to commence observations on July 1, 1877.

* Only 23 days' observation were taken in November, 1876, and only 20 days' observation were taken in December, 1876.

VICKSBURG, MISSISSIPPI.

[*Official number*, 61.]

Latitude	32° 23′
Longitude	90° 54′
Mean barometer for the year ending June 30, 1877	30.092
Mean temperature for the year ending June 30, 1877	62°.7
Amount of rain-fall for the year ending June 30, 1877	4.331 inches.

Sergeant John Dascomb was relieved April 12, 1877, for neglect of duty, and Sergeant John Laurens assigned to the station. The latter has been attentive to duty.

High water in the Mississippi at this point occurred May 9, 1877, when the gauge-reading was 41 feet and 9 inches; and low water January 7, 1877, when it was 2 feet 1 inch.

The station was inspected in March, 1877, and found in good condition.

The inspector reported neglect of duty on the part of the observer, in reference to the issue of manifold bulletins, and the sergeant was relieved from charge of the station.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	6,173
Number of Form 22 issued during the year ending June 30, 1877	43
Number of Form 26 issued during the year ending June 30, 1877	1,489
Total	7,705

VIRGINIA CITY, MONTANA TERRITORY.

[*Official number*, 77]

Latitude	45° 20′
Longitude	112° 3′
Mean barometer for the year ending June 30, 1877	29.715
Mean temperature for the year ending June 30, 1877	40°.8
Amount of rain-fall for the year ending June 30, 1877	16.45 inches.

Sergeant R. B. Watkins remained in charge of station until May 21, 1877, when he was relieved by Sergeant Edgar McGovern and ordered to Sacramento, California.

Telegraphic communication has been frequently interrupted during the year, but the mail reports have been regularly received. The station was inspected in February, 1877, and found in excellent condition.

VISALIA, CALIFORNIA.

[*Official number*, 142.]

Latitude	36° 20′
Longitude	119° 16′

Corporal R. R. Herman was ordered to establish a station at this point, per Special Orders No. 62, May 21, 1877, and to commence observations July 1, 1877.

WASHINGTON, D. C.

[*Official number*, 19.]

Latitude	38° 53′
Longitude	77° 1′
Mean barometer for the year ending June 30, 1877	30.039
Mean temperature for the year ending June 30, 1877	54°.0
Amount of rain-fall for the year ending June 30, 1877	48.74 inches.

Sergeant Theodore Mosher, jr., was discharged from the service April 20, 1877, having been appointed a second lieutenant in the Army, and Sergeant James B. Newlin was, on the same date, assigned to duty in charge of the station at Office Chief Signal-Officer. Sergeant Newlin has faithfully and satisfactorily performed his duties. Sergeant E. B. Robbins was relieved from station duty, and ordered to duty in the property division, and Sergeant G. C. Schaeffer transferred to station duty per Special Order No. 166, Office Chief Signal-Officer, October 14, 1876. Sergeant P. F. Nagle was relieved from duty at Office Chief Signal-Officer October 7, 1876, Private Hollingshead August 12, 1876, and Private A. A. Webb February 20, 1877. Sergeant D. O'Donoghue was assigned to duty at Office Chief Signal-Officer November 1, 1876.

Mr. James A. Swift, electrician, has continued in charge of the telegraph-room, and has given satisfaction. Four hundred and fifty-four post-offices have been regularly supplied with the Farmers' Bulletin from this station.

PUBLICATIONS.

Number of Farmers' Bulletins issued during the year ending June 30, 1877	139,932
Number of Bulletins (manifold) issued during the year ending June 30, 1877	11,803
Number of Maps issued during the year ending June 30, 1877	113,870
Number of Local Reports issued during the year ending June 30, 1877	837
Number of Form 15 (manifold) issued during the year ending June 30, 1877	13,658
Number of Form 22 issued during the year ending June 30, 1877	113
Number of Weekly Chronicles issued during the year ending June 30, 1877	4,453
Number of Monthly Weather Reviews issued during the year ending June 30, 1877	11,317
Number of International Bulletins issued during the year ending June 30, 1877	97,630
Total	393,649

WILMINGTON, NORTH CAROLINA.

[*Official number*, 20.]

Latitude	34° 11′
Longitude	78° 10′
Mean barometer for the year ending June 30, 1877	30.052
Mean temperature for the year ending June 30, 1877	61°.0
Amount of rain-fall for the year ending June 30, 1877	64.92 inches.

Sergeant Robert Seyboth has continued in charge of the station, and has promptly and satisfactorily attended to all his duties. During the year two assistants have been transferred to other stations. The office was inspected in June, 1877, and was found in good condition.

No change has been made in the location of office or instruments since date of last report.

The following extracts are made from the semi-annual reports of the sergeant:

The cautionary signals of April 12 to 14 proved of especial value to this port, and were undoubtedly the means of saving many lives and much property, as reported by me at the time.

The privilege of the free use of the Smithville wire for shipping messages has been continued, and many hundred telegrams have been transmitted for sea-captains, pilots, owners, tug-boats, &c., each one of which has been the means of saving more or less time and money to the Wilmington commerce. The value of the reports of arrivals and departures at and from Smithville cannot be overestimated.

Arrivals are promptly reported from Smithville and bulletined at the Commercial Exchange or furnished the press.

Twenty-six cautionary signals have been displayed during the year, of which number seventeen are reported as justified at station, and nine not justified.

The sergeant remarks as follows in reference to these displays:

September 16 *to* 17, 1876.—The coast telegraph-line, north and south of Wilmington, completely prostrated. Schooner Kate Edwards remained in harbor.

From the Daily Journal of September 19, 1876:

The storm-signal was raised, however, early on Saturday, and was kept up during that day and night following. Old Probs telegraphed that the hurricane would reach the North Carolina coast. Saturday night passed away and still there was little or no wind, but when the morning began to dawn it began to be apparent that the signal and telegram of Old Probs had created no false alarm. The storm-king had come, and was wearing his mein of sternest majesty. * * * All over the city trees were blown up by the roots, limbs and branches were broken off and scattered over the streets and over the yards. Fences were blown down, and one or two houses were partially unroofed.

October 19 *to* 21, 1876.—The signal was a warning to vessels not to leave port, as a severe northeast gale is reported from the immediate coast. No vessels left port. An unknown brig went ashore Thursday night on New Inlet Bar, near mouth of river.

December 8 *to* 10, 1876.—No vessels left port.

January 15 *and* 16, 1877.—No vessels left port. The Dutch brig Constance went ashore at the cape, and will probably prove a total loss.

March 2, 1877.—No vessels left port. The schooner John S. Lee parted her cables, was driven up stream, collided with and sunk a flat-boat and badly damaged another, and finally collided with the steamer Wave. Both schooner and steamer were much damaged. Several rafts and flat-boats were badly damaged.

March 8 *to* 10, 1877.—A tornado, with violent thunder and rain, on the 9th. Several vessels, small-boats, and rafts injured or destroyed, and considerable damage done to property ashore. The displays were well heeded by mariners in port.

April 12 *to* 14, 1877.—The display was, undoubtedly, the means of saving life and property. The gale was remarkable for its protracted fierceness. Several corn-schooners, on their way down the river, on the 12th instant, seeing the signal, returned to their wharves. The steamer Raleigh, which started down the river in face of the signal, had to anchor before reaching Smithville. Vessels in port prepared for the gale and met with little injury. Considerable damage was done to houses, roofs, trees, fences, &c. The gale on the sounds is said to have been terrible.

PUBLICATIONS.

Number of Bulletins (manifold) issued during the year ending June 30, 1877	5,241
Number of Form 22 issued during the year ending June 30, 1877	56
Total	5,297

WINNEMUCCA, NEVADA.

[*Official number*, 130.]

Latitude	41° 0′
Longitude	117° 41′

Corporal J. Healy was ordered to establish a station at this point, per Special Order No. 62, May 21, 1877, and to commence observations on July 1, 1877.

WYTHEVILLE, VIRGINIA.

[*Official number*, 91.]

Latitude	36° 56′
Longitude	81° 0′

The station was discontinued July 31, 1876. Sergeant John Craig, who was in charge until that date, was ordered to Fort Whipple, Va.

WOOD'S HOLL, MASSACHUSETTS.

[*Official number*, 60.]

Latitude	41° 33′
Longitude	70° 40′
Mean barometer for the year ending June 30, 1877	29.992
Mean temperature for the year ending June 30, 1877	49°.0
Amount of rain-fall for the year ending June 30, 1877	52.39 inches.

There has been no change in the location of office or instruments since last report. Sergeant J. K. P. Purdum remains in charge. An assistant

was ordered on duty here October 4, 1876, but was transferred April 9 to another station. Sergeant P. Belville was in charge of station from May 22 to June 30, 1877, during the absence of Sergeant Purdum.

Forty-four cautionary signals were displayed during the year, of which number twenty-four are reported as justified, and twenty not justified.

The sergeant remarks as follows in reference to these displays:

October 14 *to* 16, 1876.—Many vessels were warned by the signal of the storm, and sought harbor.

December 9 *and* 10, 1876.—Storm very severe. One vessel sunk in Vineyard Haven, and two driven ashore; crews all saved.

January 2 *to* 4, 1877.—Gale accompanied by heavy snow; harbor full of ice; fifteen vessels came to anchor off Nobsque, and thus escaped the gale.

January 24 *and* 25, 1877.—One vessel dragged her anchor and went ashore; no damage done to vessel.

February 17 *to* 19, 1877.—Several vessels made harbor, and escaped the gale.

March 8 *to* 10, 1877.—One brig was wrecked on the south side of Nantucket. At Vineyard Haven the masters took warning and secured their vessels.

March 26 *to* 29, 1877.—Between fifteen and twenty vessels took warning and made harbor, thereby escaping the gale.

April 8 *to* 10, 1877.—Very high winds in Vineyard Sound and Buzzard's Bay. The steamers Martha's Vineyard and Island Home did not make their usual trips on account of high winds.

May 2 *to* 4, 1877.—Capt. Charles Smith, of the steamer Martha's Vineyard, reports very high winds at Edgartown and Vineyard Haven, on 3d instant. A large fleet of vessels took warning, anchoring off Nobsque Point light, and in Vineyard Haven and Tarpaulin Cove.

The station was inspected in August, 1876, and May, 1877, and was found in excellent condition.

YANKTON, DAKOTA TERRITORY.

[*Official number*, 95.]

Latitude	42° 45′
Longitude	97° 30′
Mean barometer for the year ending June 30, 1877	30.020
Mean temperature for the year ending June 30, 1877	44°.06
Amount of rain-fall for the year ending June 30, 1877	35.89 inches.

Sergeant C. A. Shaw remains in charge of the station, and performs the office-work without an assistant.

The station was inspected in October, 1876, and found in a satisfactory condition. No change has been made in location of office or instruments since last report.

High water in the Missouri at this point occurred June 11 and 12, 1877, when the gauge-reading was 13 feet, and low water November 12, 1876, when it was 3 feet 9 inches.

The Daily Press and Dakotian, an evening paper, publishes in a conspicuous position the Washington morning "Indications" for the Northwest.

SAINT MICHAELS, ALASKA.

[*Official number*, 119.]

Latitude	63° 48′
Longitude	161° 0′
Mean barometer for the year ending June 30, 1877	29.822
Mean temperature for the year ending June 30, 1877	24°.7
Amount of rain-fall for the year ending June 30, 1877	*13.37 inches.

An order relieving Private L. M. Turner and ordering him to the office of the Chief Signal Officer for discharge, was issued March 15, 1877.

*Record for 11 months only. Amount of precipitation for February, 1877, unknown.

Private E. W. Nelson was assigned to station March 15, 1877, and reported for duty July 14, 1877.

The following extracts are made from daily journal kept at Fort Saint Michaels, Alaska, during the year ending June 30, 1877:

August 5, 1876.—Quite a dash of rain during the night, and that for yesterday gave .31 inch rain-fall. This rain fell as snow on the hill-tops to the eastward. The old and new snow met this year, which was not done in either of the two previous years of my stay here.

August 21, 1876.—A great number of migratory birds have left these last few days. The list includes sparrows, terns, and swallows, and as other species have not been seen lately, it is probable that they, too, have gone.

August 25, 1876.—During the past few days many berries, such as Arctic raspberries, blueberry, cowberry, and salmon-berries, have been brought here by the natives. All these berries are well flavored and form an acceptable addition to our usually plain fare. I learn that berries have never been so abundant as the present year. Blueberries were never gathered on the island before, although there is an abundance on the mainland.

September 13, 1876.—The highest tide of the year occurred at 2 a. m.; about eleven (11) feet above low water of October 17, 1875.

October 5, 1876.—A large flock of Sabine's gulls flew by to-day, from the south, and to northward. This is a rare bird in this immediate locality.

October 8, 1876.—The water to-day, at 12.30 p. m., reached the lowest point known for years. Last year, during the middle of this month, the water was very low, but to-day the water was 20 inches lower, and making a total rise and fall of fifteen and a half feet at this place.

November 12, 1876.—An aurora begun to show at 5.24 p. m., as light haziness, which gradually became denser, forming an arch at 7.10 p. m., on which beams danced with incredible velocity from east to west, and *vice versa*, with an irregular flapping up and down, of a pale, greenish-yellow above and rather deep purple below.

The center of the arch for its entire length was yellowish, and above for a width of 16′, and was green to deepest yellow, while below for about 25° the edging was blue, green, purple, red, and yellow, at different times. When an intense wave would start from near the eastern end and rush rapidly along the arch, all colors listed above would shine vividly and successively, in such quickness that it was at times impossible to keep account of their changes.

The convolutions, waves, and disturbances in general, altogether made this the most magnificent display of an aurora I have ever witnessed. The entire arch was only about 5° wide, dark segment, ill-defined, lasted until 11.30 p. m., and faded out of sight by 11.50 p. m.

November 17, 1876.—At 4.24 p. m. I was startled by two flashes of light, which dimmed, to a great degree, the flame of an argand burner. I immediately ran to the window to look for fire, but seeing none, I rushed out of doors, and looking around I saw in the WNW., *i. e.* 23° N. of W., an irregular streak of fire perpendicular to the earth. Below this a second, and a third below this.

The first streak at an altitude of 28°, about 2°.5 long and 12′ wide, then a space of 3° long and about the same width as the upper. A third was like the second or middle one, but was shorter and much brighter. All had the peculiar bright white light of the sun, not yellowish like the moon.

I immediately ran to tell Mr. Newman, who lives in the next house. He was hunting his hat to run to tell me that he had seen it fall. He describes it as descending slowly in a zig-zag manner, as indicated by its path, and that it seemed to swell and shrink in size while falling, and that the moon is about the size of the ball, and that the outlines of the meteor were not round but irregular.

We watched the light from 4.24 p. m. to 5 p. m., at which time the upper line of light had faded out of sight. The middle one had moved *westward* (nearly northward) 10°, and was now inclined to the horizon.

The third or lower was also inclined to the horizon and moving to the westward also. The middle or second one had then the exact shape of the hull of a large vessel, as plainly distinguishable as well-defined cirri streaks in day-time.

The lower faded out at 5.35 p. m. The middle one or hull-shaped lasted until 5.46 p. m., or a total length of time of one hour and twenty-two minutes.

This meteor was seen by three white men, including myself, and many natives, who were much frightened by the appearance.

January 3, 1877.—The arrival of traders from the mouth of the Yanana River, longitude 150° west of Greenwich, and latitude 65° north (Dalt's map), have reported the summer and fall as having much rain, and generally cloudy weather, with light falls of snow later, and that a cold wave held for three days about the middle of November, and so cold that even the Indians did not stir out of their houses during the time.

From Kuskoyuim River, longitude 158° west of Greenwich, and latitude 61° 53′ north (same authority), reports come that the weather was warm and mild, with little snow and much rain. At Kolmakoff station, all the snow was taken off by the rain. The river rose and threatened to break.

Along the Lower Yukon, including Delta, much snow and mild weather.

January 11, 1877.—This morning, in the midst of the flying snow, a sled arrived here, and in a few minutes a sled came from the northward and brought a letter from Mr. Clark, who left yesterday morning. Mr. Clark writes from Kégûchtouk, and that the snow-storm of 8th and 9th did not reach that place, and that he readily found his old track of January 1 and 2. (Kégûchtouk is 16 miles east of here.)

The other trader from the south reports that the snow extended up the Yukon Delta for about two-thirds its length, and extended much farther to the southward, averaging about fifteen (15) inches deep. At Unálachhlet but little snow fell.

January 25, 1877.—A great amount of frozen vapor in the air. Spiculæ of frost on everything. These spiculæ oftentimes attain a length of 2 inches, and as everything is covered with them, objects in the sunlight present a splendid sight.

February 15, 1877.—No clouds, although the flying snow was very dense at times and nearly obscured the sun. Two mock suns, parhelia, a halo, and a vertical beam were seen as the sun rose. The parhelia continued throughout the day.

February 18, 1877.—I learn to-day, from natives, that the bright meteor of November 17, 1876, was seen all along the north shore of Norton Sound. They report the winter as having been exceptionally cold.

February 28, 1877.—This month, as will be seen from the summary, has been by far the coldest month for three years, and from reports from Nulato, Tawaná (north of Tawaná River), north shore of Norton Sound, I learn that winter has been unusually severe; but little wind compared with other years; much clear or fair weather.

March 19, 1877.—Red-poll linnets flying around. They are interior residents during winter.

April 1, 1877.—Few drops of rain fell; and later, snow in light quantity of large flakes.

Much melting; the ground looks quite bare; over half of the snow is gone. Such a state of affairs is unprecedented to those who have lived here over twenty years.

April 5, 1877.—The ptarmigans, *Lagopus albus* and red-poll linnets are abundant. Most of the snow has disappeared.

April 20, 1877.—A trader, living about eighty miles northeast of this place, has arrived, and states that on the Nulato portage the snow is nearly gone; creeks are breaking up, and that ducks, gulls, and other birds have been seen.

April 27, 1877.—Several pairs of white-pouted geese, *a albifrons*, and a Canada goose, *Bernicla canadensis*, have been seen.

April 28, 1877.—The geese come in so slowly that I am led to infer the cause to be the absence of snow. The Lapland long-spur, *P. capponicus*, arrived to-day.

April 30, 1877.—The Russians say that this is an unusually early spring.

May 13, 1877.—Ice is continually chipping off, and a high tide with a southwest wind will take it out. The sea seems to be entirely free from ice, and is so, from a native's report who has been out hunting for seals.

May 22, 1877.—In this locality the arrival of the swallows makes the summer. To-day they arrived.

May 28, 1877.—At noon a huge cumulus cloud was gathering force in the northeast; at 3 p. m. loud peals of thunder and vivid flashes of lightning were discharged from the cloud. It edged over here and a few drops of rain pelted down; the part of the country over which it passed was copiously watered. The whole northeast coast was shut out by its blackness. This is probably the earliest thunder-storm that ever occurred in this locality. Haze, of a peculiar brown color, has held next to the earth for two days; it looks like smoke, but has no perceptible smell; it comes from the north.

The following table gives a summary of the observations during the year ending June 30, 1877:

Saint Michael's, Alaska.

Date.	Barometer.			Temperature.			Number of days on which rain fell.	Rain-fall, inches and hundredths.	Number of days on which snow fell.	Snow-fall, inches and hundredths.	Number of days on which rain and snow fell.	Amount of rain and melted snow, inches and hundredths.	Weather.			Wind.									Auroras.
	Mean.	Highest.	Lowest.	Mean.	Maximum.	Minimum.							Number of cloudy days.	Number of fair days.	Number of clear days.	Prevailing direction.	Number of times wind was observed blowing from the—									
																	N.	*NW.*	*W.*	*SW.*	*S.*	*SE.*	*E.*	*NE.*	*Calm.*	
1876.				°	°	°																				
July	29.808	30.295	29.219	52.7	68	39	10	1.81	.....	.....	.....	.....	23	5	3	S.	23	1	1	47	61	25	11	43	5	0
August	29.825	30.150	29.196	49.2	64	34	15	3.13	.....	.....	.....	.....	19	9	3	N.	49	17	14	40	18	4	17	44	4	0
September	29.675	30.285	28.708	44.4	59	31	.....	.....	.....	.....	17	3.24	27	3	0	S.	35	4	2	22	54	22	27	30	14	2
October	29.665	30.323	28.722	30.3	43	8	.....	.....	.....	.....	12	1.67	27	3	1	N.	87	6	1	23	16	6	6	62	9	2
November	30.145	30.632	29.495	6.89	36	—24	.....	.....	.....	.....	9	0.33	15	3	12	N.	68	20	12	40	1	2	4	19	44	7
December	29.749	30.494	28.941	3.37	36	—25	.....	.....	8	0.10	.....	.....	21	8	2	NE.	42	0	2	35	31	4	11	73	21	1
1877.																										
January	29.908	30.427	29.211	1.68	41	—39	.....	.....	10	0.93	.....	.....	18	9	4	S.	33	0	7	25	62	3	4	38	44	2
February	30.103	30.625	29.371	—23.8	12	—50	.....	.....	4	(*)	.....	.....	6	3	19	N.	58	3	7	0	8	0	9	48	42	11
March	29.880	30.179	29.290	12.7	38	—16	.....	.....	.....	.....	3	0.27	8	11	12	NE.	66	1	2	1	2	15	27	73	31	7
April	29.704	30.145	29.022	28.8	43	— 3	.....	.....	.....	.....	8	0.42	15	10	5	NE.	70	5	2	12	21	12	11	73	4	3
May	29.584	29.992	29.078	37.4	57	16	.....	.....	.....	.....	8	0.39	20	11	0	NE.	44	9	4	17	30	37	14	59	3	0
June	29.821	30.305	29.456	52.2	70	36	4	1.08	.....	.....	.....	.....	10	17	3	N.	60	11	9	40	16	18	15	33	6	0

* Unknown.

ISLAND OF SAINT PAUL, ALASKA.

[*Official number*, 120.]

Latitude ..... 57° 38′
Longitude ..... 169° 50′

In consequence of the death of Private E. J. Gill, which occurred October 22, 1876, the meteorological reports from this station, for the year ending June 30, 1877, have not been received. The last reports received from this station were those for the week ending September 2, 1876. Private Gill died from exposure and exhaustion while making a tour of the island.

SPECIAL RIVER STATIONS—JULY 16, 1877.

The following table shows the names and location of the special river stations under the direction of the Signal Office, with the date at which each began reporting originally:

Stations.	Rivers.	Names.	Commenced reporting.
1. Freeport, Pa	Alleghany	M. H. Alter	Apr. 17, 1873
2. Hermann, Mo	Missouri	Edward Kehr	Apr. 24, 1873
3. Jefferson City, Mo	do	Louis C. Lohman	May 12, 1873
4. Oil City, Pa	Alleghany	W. R. Stevenson, C. E	Apr. 20, 1873
5. Brownsville, Pa	Monongahela	J. Allen Hubbs	June 6, 1873
6. Evansville, Ind	Ohio	J. P. Elliott	Apr. 21, 1873
7. Confluence, Pa	Youghiogheny	M. Tannehill	Apr. 23, 1873
8. New Geneva, Pa	Monongahela	H. T. Davenport	Apr. 24, 1873
9. Lexington, Mo	Missouri	Z. S. Mitchell	Apr. 28, 1873
10. Kansas City, Mo	do	W. A. M. Vanghan	Apr. 21, 1873
11. Brunswick, Mo	do	G. D. Kennedy	May 1, 1873
12. Little Rock, Ark	Arkansas	Albert Cohen	Apr. 21, 1873
13. Plattsmouth, Nebr	Missouri	A. L. Child, M. D	Apr. 20, 1873
14. Marietta, Ohio	Ohio	J. H. Best	Apr. 19, 1873
15. Saint Joseph, Mo	Missouri	Robert Gunn	May 8, 1873
16. Warsaw, Ill	Mississippi	D. H. Cox	May 7, 1873
17. Paducah, Ky	Ohio	Capt. C. Bachman	May 1, 1873
18. Boonville, Mo	Missouri	Charles W. Hasell	Apr. 28, 1873
19. Le Claire, Iowa	Mississippi	C. P. Disney	June 2, 1873
20. Helena, Ark	do	J. B. Miles	Feb. 25, 1874
21. Chattanooga, Tenn	Tennessee	Charles E. Stivers	Sept. 17, 1875
22. Decatur, Ala	do	F. Ludwig	Oct. 1, 1875
23. Johnsonville, Tenn	do	W. H. Johnson	Oct. 1, 1875

Telegraphic reports of the stage of water are made daily during the months of April, May, June, October, and November. Reports are made weekly during the months of September, January, February, March, July, August, and December. Mr. A. C. Pushee, the observor at Evansville, Ind., died April 22, 1877, and Mr. J. P. Elliott was appointed in his place.

Table showing stations on the United States military telegraph line in New Mexico from which reports have been received during the year ending June 30, 1877, with the kind of reports received, whether complete or partial.

Name of station.	Reports commenced.	Date discontinued.	No. of reports by telegraph (daily).	Character of reports received by mail on Form 4 (weekly).
Fort Craig	May 21, 1877	.....	1	No reports received by mail.
Fort Bayard	*	.....	1	Do.
Fort Selden	.....	Mar. 1, 1877	.....	.....
La Mesilla	May 25, 1877	.....	1	No reports received by mail.

* Reporting at date of last annual report, June 30, 1876.

The following report is made by Lieut. S. C. Vedder, Nineteenth Infantry, acting signal-officer:

OFFICE UNITED STATES MILITARY TELEGRAPH LINE,
NEW MEXICO DIVISION,
Santa Fé, N. Mex., September 8, 1877.

SIR: I have the honor to make the following report of stations upon this United States military telegraph line, and meteorological work connected with the same, for the year ending June 30, 1877.

SANTA FÉ, NEW MEXICO.

No meteorological instruments in use at this office; a regular observation office being established, which has no connection with this line.

On duty July 1, 1876: Corporal Max Frost, Signal Service U. S. A., as clerk; C. J. Gough, civilian, as operator. C. J. Gough was discharged September 1, 1876, and Private Richard J. White, Signal Service U. S. A., relieved from duty at Albuquerque, N. Mex., and placed on duty as operator.

Private James Courtney, Signal Service U. S. A., reported for duty September 10, 1876, in compliance with Special Orders No. 140, Office Chief Signal-Officer, dated Washington, D. C., August 28, 1876, and was assigned to duty at Santa Fé, N. Mex., as assistant operator (clerk).

Sergeant Max Frost, Signal Service U. S. A., was relieved from duty as clerk, and placed in charge of repairs and repairmen September 10, 1876.

Private Robert Reeder, Signal Service U. S. A., reported for duty September 16, 1876, in compliance with Special Orders No. 144, Office Chief Signal-Officer, dated Washington, D. C., September 4. 1876, and was ordered to duty as operator at Fort Selden, N. Mex., September 30, 1876.

On April 17, 1877, Private R. J. White, Signal Service U. S. A., was ordered to Fort Craig, N. Mex., as operator, being succeeded by A. G. Stolbrand, who was employed as chief operator and manager.

On May 20, 1877, J. W. Anderson, civilian, was employed as clerk, and on June 16, 1877, A. E. Lindsay, civilian, as assistant operator, and E. Rowcroft as messenger. On May 28, 1877, Private James Courtney was relieved and ordered to Detroit, Mich., by Special Orders No. 66, Office Chief Signal-Officer, dated Washington, D. C., May 28, 1877. Force, June 30, 1877: Sergeant Max Frost, Signal Service U. S. A.; A. G. Stolbrand, A. E. Lindsay, J. W. Anderson, and E. Rowcroft, civilians.

ALBUQUERQUE, NEW MEXICO.

No meteorological instruments at this station. On duty July 1, 1876, Private R. J. White, Signal Service U. S. A. On September 1, 1876, Private White was relieved and ordered to Santa Fé, N. Mex. His successor, W. J. Codington, civilian, remained in charge until December 31, 1876, when he was relieved by W. M. Keightley, civilian, who remained in charge until May 24, 1877, when Private Hermann Voss, Signal Service U. S. A., was ordered to assume charge of the office.

LOS LUNAS, NEW MEXICO.

No meteorological instruments at this station. The following telegraph instruments in use: One sounder, one key, one relay, one cut-out. This station was opened December 20, 1876, and W. M. Smith, civilian, was placed in charge as operator, and still remains in charge of same.

BELEN, NEW MEXICO.

No meteorological instruments at this station. The following telegraph instruments at this station: one sounder, one key, one relay, one cut-out. This station was opened June 1, 1876, and John Becker, civilian operator, placed in charge, and closed December 14, 1876, since which time it has been a branch office of Los Lunas, N. Mex., all accounts, &c., being made up at Los Lunas, N. Mex. office.

SOCORRO, NEW MEXICO.

This office was opened on January 1, 1877, W. J. Codington, civilian operator, was placed in charge, and closed June 5, 1877. It is the intention, however, to reopen this office as soon as an operator can be procured.

FORT CRAIG, NEW MEXICO.

Meteorological instruments: two barometers, one standard thermometer, one maximum thermometer, one minimum thermometer, one rain-gauge. On duty July 1,

1876, Private Kissell, Fifteenth Infantry, who was relieved August 29, 1876, by Private C. J. Costello, Signal Service, U. S. A. Relieved April 17, 1877, by Private R. J. White, Signal Service, U. S. A., and ordered to Ralston, N. Mex., for construction duty. Reassigned to duty at Fort Craig, N. Mex., May 24, 1877. Meteorological observations commenced May 21, 1877, consisting of one daily observation of barometer, thermometer, weather, wind and rain-fall, at 2.39 p. m., Washington time. Arrangements are complete for regular tri-daily observations from July 1, 1877.

FORT McRAE, NEW MEXICO.

On duty July 1, 1876, Private C. J. Costello, Signal Service, U. S. A., who remained until August 29, 1876, when the office was closed, and Private Costello ordered to Fort Craig, N. Mex.

FORT SELDEN, NEW MEXICO.

No meteorological instruments at this station.

On duty July 1, 1876, Sergeant John McCann, Signal Service, U. S. A. Sergeant McCann was reduced to the ranks as a private, and discharged the service September 1, 1876. Private Robert Reeder, Signal Service, U. S. A., assumed charge of office September 30, 1876, remaining until March 8, 1877, when he was ordered to Fort Bayard, N. Mex., as operator.

The telegraph-office closed, and repair station, with an enlisted man, Fifteenth Infantry, as repair-man, established.

From June 12, 1876, to March 8, 1877, one daily meteorological observation, consisting of temperature, wind, weather, and rain-fall, was taken.

LA MESILLA, NEW MEXICO.

Meteorological instruments: Two barometers, one standard thermometer, one maximum thermometer, one minimum thermometer, one rain-gauge.

Station opened July 16, 1876, with F. Cowles, civilian operator, in charge, who remained until March 31, 1877, when he was relieved by A. Sterreberg, civilian operator, who was relieved on May 24, 1877, by Private R. J. White, Signal Service, U. S. A., who still remains in charge.

On May 25, 1877, meteorological reports, consisting of one observation daily, of thermometer, wind, weather, and rain-fall were commenced.

Arrangements are complete for regular tri-daily observations from July 1, 1877.

A branch to this office was established at Los Cruces N. Mex., April 10, 1877, with George Deneson, civilian operator, who was succeeded on May 15 by Fred. Cowles, civilian operator, who was discharged June 30, 1877, and the branch office closed.

FORT BAYARD, NEW MEXICO.

Meteorological instruments: Two barometers, one standard thermometer, one maximum thermometer, one minimum thermometer, one rain-gauge.

On duty July 1, 1876, Sergeant A. P. Guthrie, Signal Service, U. S. A., who died July 17, 1876.

Private Hermann Voss, Signal Service, U. S. A., was placed in charge August 22, 1876, remaining until March 18, 1877, when he was ordered to Ralston, N. Mex., for construction duty, and relieved by Private Robert Reeder, Signal Service, U. S. A., who still remains.

Meteorological observations, consisting of one daily observation of thermometer, wind, weather, and rain fall were commenced June 12, 1876.

Arrangements are complete to commence regular tri-daily reports on July 1, 1877.

SILVER CITY, NEW MEXICO.

No meteorological instruments at this station.

On July 1, 1876, C. O. Butts, civilian operator, was in charge, who remained until May 1, 1877, and was succeeded by Fred. Cowles, civilian operator, who, on May 15, 1877, was relieved by B. W. Rice, civilian operator, who still remains.

Very respectfully, your obedient servant,

S. C. VEDDER,

Lieutenant Nineteenth Infantry, Acting Signal-Officer, U. S. A.

To the CHIEF SIGNAL-OFFICER OF THE ARMY,
Washington, D. C.

Table showing stations on the United States military telegraph-line in Texas, from which reports have been received during the year ending June 30, 1877, with the kind of reports sent, whether complete or partial.

Name of station.	Reports commenced.	No. of reports by telegraph, (daily.)	Character of reports received by mail on Form 4 (weekly).
Boerne	(*)	2	Complete observations taken twice a day.
Brackettville	(*)	1	Complete observations taken once a day.
Brownsville	(*)	3	Complete observations taken three times a day.
Cambridge	(*)	1	Complete observations taken once a day.
Coleman City	(*)	1	No reports received by mail.
Castroville	(*)	1	Do.
Concho	(*)	1	Complete observations taken once a day.
Decatur	(*)	1	Do.
Denison	(*)	3	Complete observations taken seven times a day.
Eagle Pass	(*)	3	Complete observations taken three times a day.
Edinburg	(*)	1	
Fredericksburg	(*)	1	Complete observations taken once a day.
Fort Sill, Indian Ter.	(*)	3	Complete observations taken three times a day.
Graham	(*)	1	Observation of barometer, thermometer, direction of wind and state of weather, clouds, and rain-fall taken once a day.
Fort Griffin	(*)	3	Complete observations taken three times a day.
Jacksboro	(*)	3	No reports received by mail.
Laredo	(*)	3	Complete observations taken, except barometer, three times a day.
Mason	(*)	3	Complete observations taken three times a day.
Fort McKavett	(*)	1	No reports received by mail.
Pilot Point	(*)	1	Do.
Rio Grande City	(*)	1	Observations of thermometer, direction of wind and state of weather, clouds, rain-fall, and maximum and minimum thermometers once a day.
San Antonio	(*)	3	Complete observations taken three times a day.
Stockton	(*)	3	Do.
Uvalde	(*)	1	Complete observations taken once a day.

* Reporting at date of last annual report, June 30, 1876.

The following report is made by Lieut. G. S. Grimes, Second Artillery, acting signal officer:

CENTRAL OFFICE,
Denison, Tex., June 30, 1877.

The meteorological work at this station has been performed during the year by Corporal W. A. Massey. In addition to the regular observations and reports required from full reporting stations, the further duty of collecting and consolidating the meteorological observations taken at the several offices on the line, and which are concentrated by telegraph at this point for transmission to Chief Signal-Officer at Washington, D. C., devolves upon the observer, who has performed, unaided, the duties required with promptness and satisfaction. Denison was made a full reporting station February 19, 1877.

The operating department of this office was in charge of Mr. M. M. Herrington from June 30, 1876, to September 20, 1876, when he was transferred to San Antonio, Tex., being relieved at Denison, Tex., by Private Eugene Peters, Signal Service, who was in charge June 30, 1877.

Private John V. Brown, Signal Service, was on duty as chief clerk in this office from June 30, 1876, to August 18, 1876, when he was discharged.

Sergeant H. M. Ludwig, Signal Service, was then assigned to this duty, and continued upon it until April 19, 1877, when he was discharged by reason of expiration of term of service. Since that date Corporal R. R. Geraghty, Signal Service, has been on duty as chief clerk, and has performed the duties with intelligence and zeal.

Private I. V. Wallace, Signal Service, on duty as clerk in this office June 30, 1876, continued on that duty until discharged for misconduct, April 20, 1877.

Private Frederick Belford reported at this office May 6, 1877, and continued on duty until June 10, 1877, when he was ordered to Eagle Pass, Tex., in charge of the office at that point.

Signal Service men on duty at Denison June 30, 1877, are Corporals R. R. Geraghty, William A. Massey, and Eugene Peters.

PILOT POINT, TEXAS.

Private Frank Mangels, Signal Service, has been in charge of this station during the year ending June 30, 1877.

In addition to telegraph work performed at this station, Private Mangels has a section of 40 miles of line to keep in repair.

DECATUR, TEXAS.

Private James H. Crowley, Signal Service, was in charge of this office June 30, 1876, and continued on duty until September 19, 1876, when he was relieved by Private Richard J. Somers, Signal Service, and ordered to Brownsville, Tex.

Private Somers was in charge June 30, 1877. Forty miles of line are maintained in repair from this station, in addition to the telegraph work.

JACKSBORO [FORT RICHARDSON], TEXAS.

Sergeant George J. Rowley, Signal Service, was in charge of this office June 30, 1876, assisted by Corporal J. M. Kistler and Private Charles H. Mays, Signal Service, as repair-men.

Sergeant George S. Rowley, Signal Service, was discharged August 4, 1876, being relieved by Mr. T. J. Barry, who remained in charge until March 31, 1877, when he was discharged for dishonest practices, the duties of the office being temporarily performed by Mr. Floyd Shock.

Private P. M. Wilson, Signal Service, relieved from duty at McKavett, Tex., and assigned to this station, joined for duty April 11, 1877, and remained in charge June 30, 1877, with Corporal Kistler as repair-man.

Private Charles H. May was assigned July 14, 1876, to temporary duty at Denison Tex., and relieved therefrom and assigned to duty as line-repairer at San Antonio November 21, 1876.

Jacksboro was designated a full reporting station May 21, 1877. The duties have been well performed by Private Wilson.

From this station about fifty miles of line are maintained in order, and the duties efficiently performed by Corporal Kistler.

CAMBRIDGE, TEXAS.

Private W. M. Weddington, Signal Service, has been in charge of this station during the year. The duties have been performed satisfactorily.

About forty miles of line are maintained in repair by this operator.

HENRIETTA, TEXAS.

This office was opened at the earnest solicitation of the citizens of Henrietta. The town is situated about three miles from Cambridge, and the citizens, at their own expense, built the line from the latter place to the town. This office supplied the wire, insulators, and instruments, and the office was opened for business February 1, 1877. The operator and office are furnished and paid for by the people, the office being at no expense for its maintenance, except for necessary articles of stationery, lights, fuel, &c. The earnings of the office are remitted in full to the central office. No meteorological reports are forwarded from this station. Mr. George I. Cole was in charge of the office June 30, 1877.

FORT SILL, INDIAN TERRITORY.

Private Eugene Peters, Signal Service, was in charge of this office June 30, 1876, and continued on duty until relieved by Mr. George I. Copp September 6, 1876. Private Peters was assigned to duty at Denison, Tex., to date November 6, 1876. Mr. Copp was in charge of Fort Sill office June 30, 1877.

Fort Sill was designated a full reporting station May 21, 1877. All the duties of the station were creditably performed by Mr. Copp.

About forty-three miles of line are maintained in order from this station.

GRAHAM, TEXAS.

Mr. T. J. Barry was in charge of this station June 30, 1876, and remained until about August 4, when he was assigned to Jacksboro, Tex., being relieved at Graham by Mr. Floyd Shock, who continued in charge during the remainder of the year. In addition to the telegraph work, about forty miles of line are repaired from this station.

FORT GRIFFIN, TEXAS.

Private H. A. Rathvon was in charge of this station June 30, 1876, and continued on duty until April 8, 1877, when he was relieved for dishonest practices by Sergeant J. T. Bradley, Signal Service.

Private Rathvon was discharged, without character, at Denison, Tex., April 20, 1877.

Griffin was designated a full reporting station May 21, 1877.

About forty miles of line are maintained in repair from this station. The station work has been generally well performed by Sergeant Bradley.

COLEMAN CITY, TEXAS.

This station was opened April 1, 1877, Private C. R. Browder, Signal Service, in charge, who continued on duty until June 24, 1877, when he was relieved by Private C. A. Ray, Signal Service, and ordered to Fort Whipple, Va., on account of ill-health.

Private Ray was in charge June 30, 1877. In addition to telegraph work, about ninety miles of line are maintained in repair by the operator in charge.

FORT CONCHO, TEXAS.

Private W. J. Cundall, Signal Service, was in charge of this station June 30, 1876, assisted by Private John Peters, Signal Service, as repairman.

Private Cundall was relieved July 18, 1876, and assigned to Eagle Pass, relieving Private T. W. Milburn, ordered from Eagle Pass to Concho. The latter was relieved and assigned to duty at San Antonio April 19, 1877, being relieved at Concho by Private Cundall. The latter was in charge June 30, 1877.

Concho was designated a full reporting station July 3, 1877.

About one hundred miles of line are maintained in order by the repairman on duty at this station.

FORT STOCKTON, TEXAS.

Private James O'Dowd was in charge of this station June 30, 1876, and continued thereat during the year.

Stockton was designated a full reporting station May 21, 1877.

About fifty miles of line are maintained in repair from this station.

The duties have latterly been satisfactorily performed by Private James O'Dowd.

FORT McKAVETT, TEXAS.

Private E. G. Prince, Signal Service, was on duty at this station June 30, 1876.

He was relieved and assigned to Fredericksburg November 6, 1876, relieving at the latter place Corporal P. M. Wilson, Signal Service, who was assigned to McKavett same date. The latter was relieved and assigned to Jacksboro March 20, 1877.

Private Wilson was relieved by Mr. C. F. Burroughs, who was in charge of the station June 30, 1877.

About forty miles of line are maintained in repair from this station.

MASON, TEXAS.

Private Frank King was in charge of this station June 30, 1876; relieved and ordered to Rio Grande City July 26, 1876, relieving at the latter place Corporal H. C. Wineland, who was ordered to Mason same date. Corporal Wineland was relieved and ordered to Brownsville November 6, 1876. Private J. C. Rickli joined for duty at Mason December 9, 1876, and was in charge June 30, 1877.

Mason was designated a full reporting station June 1, 1877.

About forty miles of wire are maintained in repair from this station. The duties have been satisfactorily performed by Corporal Rickli.

FREDERICKSBURG, TEXAS.

Private P. M. Wilson, Signal Service, was in charge of this station June 30, 1876, and continued in charge until relieved by Private E. G. Prince November 6, 1876, and ordered to Jacksboro. Private Prince was in charge June 30, 1877. Private Prince has performed his duties in a satisfactory manner.

About forty miles of line are maintained in repair from this station.

BOERNE, TEXAS.

Miss Pollmar was in charge of station June 30, 1876, and continued in charge until December 6, 1876, when she was relieved by Sergeant William Dowes, Signal Service, and discharged. Sergeant Dowes was relieved and ordered to Fort Sill, June 19, 1877, by Mr. Eugene Lane, who was in charge June 30, 1877. This station maintains in repair about forty miles of line.

SAN ANTONIO, TEXAS.

Mr. N. J. Petrich was in charge of this office June 30, 1876, with two other civilian assistants. He was relieved November 1, 1876, by Mr. M. M. Herrington. The latter was relieved by Corporal T. W. Milburn, Signal Service, April 21, 1877, and discharged April 30, 1877. Corporal Milburn with one civilian assistant, Miss Anna Pollmar, were on duty at this station June 30, 1877. San Antonio was designated a full reporting station May 21, 1877.

CASTROVILLE, TEXAS.

Private Julius Gerard, Signal Service, was in charge of this station June 30, 1876, and continued in charge until relieved for inefficiency, March 31, 1877, by Corporal W. J. Smith, Signal Service, ordered here from Brownsville, Texas. The latter was in charge June 30, 1877. About forty miles of line are maintained in repair by the operator in charge.

D'HANIS, TEXAS.

An office was opened at this place June 1, 1877. Mr. John Yates in charge June 30, 1877.

No meteorological reports are sent from this station.

UVALDE, TEXAS.

Mr. George O. Appleby was in charge of this station June 30, 1876. Was relieved February 11, 1877, and assigned to duty at Eagle Pass, relieving Private W. J. Cundall, Signal Service, who was ordered to Uvalde. Private Cundall was relieved April 19, 1877, and transferred to Concho, Texas. Mr. Eugene Lane succeeded Private Cundall.

Mr. Lane was relieved by Mr. Appleby June 19, 1877, and assigned to duty at Boerne.

Mr. Appleby was in charge June 30, 1877. About forty miles of line are maintained in repair by the operator in charge.

BRACKETTVILLE, TEXAS (FORT CLARK).

Private W. R. Partrick, Signal Service, was in charge of this station June 30, 1876, and continued in charge until June 23, 1877, when he was relieved by Sergeant I. T. Shadle, Signal Service.

Private Partrick was discharged at his own request, June 30, 1877.

Sergeant Shadle was in charge June 30, 1877.

Brackettville was designated a full reporting station July 3, 1877.

About forty miles of line are maintained in repair from this station.

EAGLE PASS TEXAS (FORT DUNCAN).

Private T. W. Milburn and Corporal J. J. Buckley were on duty at this station June 30, 1876, the former as operator and the latter as repairer.

Private Milburn was relieved by private W. J. Cundall July 18, 1876, and ordered to Concho, and the latter assigned to Eagle Pass.

Private Buckley was discharged July 29, 1876.

Private Cundall was relieved by Mr. George O. Appleby February 16, 1877, and assigned to duty at Uvalde.

Mr. Appelby was relieved from Eagle Pass June 15, 1877, by Private F. Belford, Signal Service, and assigned to duty at Uvalde.

Private Belford was in charge June 30, 1877, with private T. B. Bowlus, Signal Service, as repairer.

Private Bowlus was assigned to Eagle Pass August 1, 1876.

Eagle Pass was designated a full reporting station June 1, 1877.

About one hundred miles of line are maintained in repair from this station.

LAREDO, TEXAS (FORT McINTOSH).

Sergeant John McGlone, Signal Service, has been in charge of this station during the year.

Laredo was designated a full reporting station June 1, 1877.

Private M. L. Miller, Signal Service, has been on duty at this station during the year as repairer.

About one hundred miles of line are maintained in repair from this station.

Both men have performed their duties generally in a satisfactory manner.

EDINBURG, TEXAS.

Private E. T. Peck, Signal Service, was in charge of this station June 30, 1876, and has remained in charge during the year.

About forty miles of line are maintained in repair from this station.

RIO GRANDE CITY, TEXAS (RINGGOLD BARRACKS).

Corporal H. C. Wineland, Signal Service, was in charge of this station, assisted by Private James.Brown, repairman, June 30, 1876; was relieved July 26, 1876, by Private Frank King, and ordered to Mason. Private King was relieved by Sergeant J. R. Williams, Signal Service, December 7, 1876, and assigned to duty at Stockton, Texas, but never joined, having been arrested by civil authorities for cutting the Western Union wires and forging an order for a sum of money.

Private King was discharged, without character, July 7, 1877.

Private Brown has remained on duty at this station during the year.

Sergeant Williams was in charge June 30, 1877.

About one hundred miles of line are maintained in repair from this station.

The duties of this station have been satisfactorily performed.

BROWNSVILLE, TEXAS.

Private W. E. Smith, Signal Service, was in charge of this station June 30, 1876, and remained in charge until relieved by Corporal H. C. Wineland, November 6, 1876.

Private Smith was relieved from duty at Brownsville, and ordered to Castroville, relieving Private Julius Gerard at the latter point, who was ordered to Brownsville March 31, 1877.

Corporal Wineland and Private Gerard remained on duty at Brownsville June 30, 1877.

Private Gerard proved a most inefficient, careless, and unreliable man while on duty at Castroville, and shows no improvement at his present station.

About twenty-five miles of line are maintained in repair from this station.

Brownsville was designated a full reporting station June 1, 1877.

Table showing stations on the United States military telegraph-line in Arizona and California from which reports have been received during the year ending June 30, 1877, with the kind of reports sent, whether complete or partial.

Name of station.	Reports commenced.	Date discontinued.	No. of reports by telegraph (daily).	Character of reports received by mail on Form 4 (weekly).
Campo, Cal	(*)	.....	1	Complete observations taken three times a day.
Camp Lowell, Ariz	(*)	June 11, 1877	.....	
Florence, Ariz	(*)	.....	1	Observations of barometer, thermometer, direction of wind, and state of weather and clouds taken three times a day.
Maricopa Wells, Ariz	(*)	.....	1	Complete observations, except barometer, taken three times a day.
Camp Verde, Ariz	(*)	.....	1	Observations of thermometer, direction of wind and state of weather and clouds taken three times a day.
Phœnix, Ariz	(*)	.....	1	Complete observations, except barometer and velocity of wind, taken three times a day.
Prescott, Ariz	(*)	.....	1	Observations of thermometer, clouds, rain-fall, and state of weather taken three times a day.
Stanwix, Ariz	(*)	.....	1	Complete observations, except barometer and direction of wind, taken three times a day.
Tucson, Ariz	(*)	.....	1	Complete observations, except velocity of wind and maximum and minimum thermometers, taken three times a day.
Wickenburg, Ariz	(*)	.....	1	Observations of thermometer, direction of wind, and state of weather taken three times a day.
Yuma, Ariz	(*)	.....	1	Complete observations, except maximum and minimum thermometers, taken three times a day.

* Reporting at date of last annual report, June 30, 1876.

CAMP BOWIE, ARIZONA TERRITORY.

This office was opened April 18, 1877, by Private John W. Harrison, Company H, Sixth Cavalry, who now remains in charge.

Private F. Cull, Company H, Sixth Cavalry, has been on duty as repairman.

The following is a summary of telegraphic work for the fiscal year ending—

June 30, 1877.—Commercial messages received, 63; sent, 70. Official messages received, 130; sent, 263.

Private Harrison, in charge, is not instructed in meteorological work, and there are no instruments at the station.

STEWART'S RANCH (CAMP GRANT), ARIZONA TERRITORY.

Private William Story, Signal Service, remained in charge until July 6, 1876. His successors were: Private H. H. Hull, Signal Service, July 6, 1876, to December 26, 1876; Private John J. Falvey, Signal Service, December 26, 1876, to date.

The following is a summary of telegraphic work for the fiscal years ending—

June 30, 1876.—Commercial messages received, 686; sent, 801. Official messages received, 663; sent, 663.

June 30, 1877.—Commercial messages received, 574; sent, 669. Official messages received, 487; sent, 597.

Meteorological instruments have been forwarded, and regular tri-daily observations and reports will commence July 1, 1877.

CAMPO, CALIFORNIA.

Under this office is recorded all the business of three offices—Mountain Springs, Indian Wells, and Campo—there being but one set of books and records, the office being merely a repair station, which has been moved to and fro between San Diego and Yuma as circumstances required. It was opened by Mr. C. O. McGrew at Mountain Springs January, 1874, thence moved to Indian Wells March 1, 1874, where Mr. McGrew was relieved June 1, 1874. His successors were: Mr. William Ellison, June 1 to July 1, 1874; Mr. George S. Safford, July 1 to August 1, 1874; Private F. C. Kelley, Signal Service, November 3, 1874, to date. Private G. W. Burrows, Company H, Eighth Infantry, has served as repairman at this station from October 5, 1876, to June 30, 1877.

On March 1, 1875, the office was moved from Indian Wells to Campo, where it now remains.

The following is an exhibit of its telegraphic business for the years ending—

June 30, 1874.—Commercial messages received, 22; sent, 9.

June 30, 1875.—Commercial messages received, 55; sent, 93. Official messages received, 57; sent, 52.

June 30, 1876.—Commercial messages received, 229; sent, 315. Official messages received, 43; sent, 48.

June 30, 1877.—Commercial messages received, 244; sent, 282. Official messages received, 38; sent, 42.

Meteorological reports sent to the office of the Chief Signal-Officer by telegraph June 30, 1876, 150; June 30, 1877, 478.

Tri-daily meteorological reports have been made since January 25, 1876, and the p. m. report has been regularly telegraphed to the Office of the Chief Signal-Officer. The sunset report commenced February 20, 1877.

Private F. C. Kelley, Signal Service, was instructed in meteorological duties by Sergeant William Phoedovius in September, 1875.

The following meteorological and telegraphic instruments are on station: One key (telegraph), one sounder, one relay, one barometer, one thermometer, one hygrometer (complete), one anemometer, one wind-vane, one rain-gauge, one measuring stick, one maximum thermometer, and one minimum thermometer.

CAMP LOWELL (CORILLA STATION), ARIZONA TERRITORY.

This office was opened March 6, 1875, by Private James Purkis, Signal Service, who remained in charge until January 26, 1876. His successors were: Sergeant A. M. Geissinger, Signal Service, January 26, 1876, to October 23, 1876, when he was discharged. Private Levi Pitts, Signal Service, was on duty from October 23, 1876, to June 11, 1877, when the office was temporarily closed, to open an important repair-office at Tres Alamos.

The following is a summary of telegraphic work for the fiscal years ending—

June 30, 1875.—Commercial messages received, 80; sent, 78. Official messages received, 387; sent, 359.

June 30, 1876.—Commercial messages received, 155; sent, 108. Official messages received, 566; sent, 502.

June 30, 1877.—Commercial messages received, 118; sent, 134. Official messages received, 690; sent, 650.

Meteorological reports sent to the Office of the Chief Signal Officer by telegraph June 30, 1876, 120; June 30, 1877, 404.

Tri-daily meteorological reports were made and the p. m. telegraphic report forwarded to the Office of the Chief Signal-Officer from February 10, 1876, to date of closing, June 11, 1877.

The following instruments are at station, to be used when re-opened: One standard thermometer, one rain-gauge, one measuring stick, and one wind-vane.

FLORENCE, ARIZONA TERRITORY.

This office was opened November 12, 1874, by Private W. C. Barden, Signal Service, who remained in charge until January 27, 1875. His successors were: Sergeant A. M. Geissinger, Signal Service, January 27, 1875, to January 28, 1876; Private James Purkis, Signal Service, January 28, 1876, to April 3, 1876; Private John Carroll, Signal Service, April 3, 1876, to April 20, 1877, when taken sick with small-pox—he died April 29, 1877; Private C. M. Clark, Signal Service, April 22, 1877, to May 11, 1877; Private H. A. Dusouchet, Signal Service from May 11, 1877, to date. There has served at this office as repairman Private William Gold, Company I, Sixth Cavalry, September 24, 1876, to date.

The following is an exhibit of the telegraphic work for the fiscal years ending—

June 30, 1875.—Commercial messages received, 375; sent, 517. Official messages received, 25; sent, 24.

June 30, 1876.—Commercial messages received, 1,850; sent, 2,165. Official messages received, 31; sent, 23.

June 30, 1877.—Commercial messages received, 2,532; sent, 3,021. Official messages received, —; sent, 17.

Meteorological reports sent to the Office of the Chief Signal-Officer by telegraph June 30, 1876, 113; June 30, 1877, 405.

Tri-daily meteorological reports have been made since January 25, 1876, and the p. m. report has been regularly telegraphed to Office of the Chief-Signal Officer. The sunset report commenced February 20, 1877.

Private H. A. Dusouchet has been instructed in meteorology by Sergeant S. E. Patton in October, 1876.

The following instruments are at station: One barometer, one thermometer, one hygrometer (complete), one wind-vane, one rain-gauge, and one measuring stick.

MELVIN'S, STATION (CAMP VERDE), ARIZONA TERRITORY.

This office was opened November 9, 1874, by Private William Story, Signal Service, who remained in charge until September 22, 1875. His successors were: Private William T. Burbridge, Signal Service, September 22, 1875, to November 2, 1876; Private John J. Falvey, Signal Service, from November 2, 1876, to November 28, 1876; Sergeant William Phoedovius, Signal Service, from November 28, 1876, to January 30, 1877; Private William Baber, Signal Service, from January 30, 1877, to date. Private Falvey remained as assistant from November 28 to December 26, 1876. Private William Ramsay, Signal Service, was on duty as repairman from November 9, 1874, to January 11, 1875.

The following is a summary of the telegraphic work for the fiscal years ending—

June 30, 1875.—Commercial messages received, 179; sent, 250. Official messages received, 319; sent, 348.

June 30, 1876.—Commercial messages received, 381; sent, 456. Official messages received, 664; sent, 640.

June 30, 1877.—Commercial messages received, 305; sent, 409. Official messages received, 413; sent, 515.

Meteorological reports sent to the Office of the Chief Signal-Officer by telegraph, June 30, 1876, 130; June 30, 1877, 359.

Tri-daily meteorological reports have been made since February 17, 1876, and the afternoon report has been regularly telegraphed to the Office of the Chief Signal-Officer. Tri-daily reports by telegraph to Washington have been ordered to commence July 1, 1877. The sunset report commenced February 20, 1877.

The following instruments are on station: One thermometer, one wind-vane, one rain-gauge, one measuring stick.

MARICOPA WELLS, ARIZONA TERRITORY.

This office was opened November, 1873, by Mr. C. W. Gearheart, who remained in charge until July 4, 1874. His successors were Mr. P. Kearney, July 4 to 25, 1874 Mr.

L. Ballou, July 25, 1874, to November 17, 1874; Private C. M. Clark, Signal Service, November 17, 1874, to May, 1875; Private G. A. Ochus, Signal Service, May, 1875, to January 28, 1876; Private C. M. Clark, Signal Service, January 28, 1876, to October 7, 1876; Private H. A. Dusonchet, Signal Service, October 7, 1876, to May 9, 1877; Sergeant I. R. Birt, Signal Service, May 9, 1877, to date.

The following have been assistants: Private O. K. Tompkins, Signal Service, May 24, 1875, to June 14, 1875; William T. Burbridge, Signal Service, June 14, 1875, to September 22, 1875; William Story, Signal Service, September 22, 1875, to November 8, 1875.

The following detailed men, Department Arizona, have served as repairmen: Sergeant W. R. Reed, Company C, Eighth Infantry, April 17, 1875, to October 3, 1876; Private J. Donahue, Company C, Eighth Infantry, October 4, 1876, to May 5, 1877; Private J. Burke, Company I, Sixth Cavalry, August 28, 1876, to March 6, 1877; J. Robinson, Company I, Sixth Cavalry, March 6, 1877, to date.

The following is an exhibit of the telegraphic business of the office for the fiscal years ending—

June 30, 1874.—Commercial messages received, 142; sent, 212. Official messages received, 9; sent, 17.

June 30, 1875.—Commercial messages received, 350; sent, 441. Official messages received, 66; sent, 89.

June 30, 1876.—Commercial messages received, 537; sent, 679. Official messages received, 18; sent, 17.

June 30, 1877.—Commercial messages received, 548; sent, 714. Official messages received, 5; sent, 17.

Meteorological reports sent to the Office of the Chief Signal-Officer by telegraph June 30, 1876, 145; June 30, 1877, 410.

Tri-daily meteorological reports have been made since January 25, 1876, and the afternoon report has been regularly telegraphed to the Office of the Chief Signal-Officer. Tri-daily reports by telegraph to Washington have been ordered to commence July 1, 1877. The sunset report commenced February 20, 1877.

The following instruments are on station: One thermometer, one wind-vane, one rain-gauge, one measuring stick, two repeating-buttons, four cut-outs, lightning-arrester and ground-wire combined.

The main work of this station consists in tending repeater-button and in bad condition of line in relaying messages. During each year thousands of messages have been relayed.

PHŒNIX, ARIZONA TERRITORY.

This office was opened in November, 1873, by Mr. Morris Goldwater, who remained in charge until August 3, 1874. His successors have been: Mr. R. H. Howe, August 3, 1874, to November, 1874; Private H. H. Hull, Signal Service, July 6, 1876; Private William Story, Signal Service, from July 6, 1876, to October 7, 1876; Private C. M. Clark, Signal Service, from October 7, 1876, to June 1, 1877; Private John J. Nanry, Signal Service, from June 1, 1877, to date.

Private Clark temporarily closed the office about April 20, 1877, and was in charge of Florence office until he reopened Phœnix, May 9, 1877. Private Clark remained on duty, but is under orders to Tucson.

The following repairmen have served at this office; Private J. J. McElroy, Company I, Sixth Cavalry, July 6, to October 18, 1876; Private W. Aloyse, Company I, Sixth Cavalry, October 21, 1876, to date.

The following is an exhibit of the telegraphic business of this office for the years ending—

June 30, 1874.—Commercial messages received, 255; sent, 320. Official messages received, 29; sent, 25.

June 30, 1875.—Commercial messages received, 1,139; sent, 1,253. Official messages received, 43; sent, 47.

June 30, 1876.—Commercial messages received, 1,806; sent, 2,199. Official messages received, 108; sent, 160.

June 30, 1877.—Commercial messages received, 1,692; sent, 1,918. Official messages received, 259; sent, 309.

Meteorological reports sent to the Office of the Chief Signal-Officer by telegraph June 30, 1876, 146; June 30, 1877, 383.

Tri-daily meteorological reports have been made since January 28, 1876, and the afternoon report has been regularly telegraphed to the Office of the Chief Signal-Officer. The sunset report commenced February 20, 1877.

The following instruments are on station; One barometer, one thermometer, one hygrometer (complete), one anemometer, one wind-vane, one rain-gauge, one measuring stick, one maximum thermometer, and one minimum thermometer.

PRESCOTT, ARIZONA TERRITORY.

This office was opened on November 19, 1873, by Mr. William Ellison, who remained in charge to April 1, 1874. His successors have been Mr. John W. Strauchun, April 1, 1874, to August 4, 1874, being chief operator during that time; Mr. P. Kearney, August 4, 1874, to December 1, 1875; Private C. M. Clark, Signal Service, December 1, 1875, to January 28, 1876; Private G. A. Ochus, Signal Service, January 28, 1876, to March 29, 1877, when relieved by Mr. W. H. Auston, and again assumed charge April 30, 1877 (time of Auston's desertion), and remained in charge until arrival of Private Story, May 9, when he also deserted. Mr. W. H. Auston was in charge from March 29, 1877, to April 30, 1877, Private Ochus being sick and at station; Private William Story, Signal Service, May 9, 1877, to date. Private C. M. Clark, Signal Service, served as assistant from May 6, 1875, till he assumed charge December 1, 1875.

The following enlisted men, Department of Arizona, have served at this office: Private Francis Claude, Company H, Sixth Cavalry, repairman, July 20, 1876, to ——— ———; Private J. Coleman, Company K, Sixth Cavalry, repairman, September 25, 1876, to ——— ———; Private W. H. Walters, Company K, Sixth Cavalry, messenger, July 1, 1876, to date; Private J. M. Frayer, Company K, Sixth Cavalry, repairman, June 12, 1877, to date.

The following is an exhibit of the telegraphic work of this office for the fiscal years ending—

June 30, 1874.—Commercial messages received, 731; sent, 608. Official messages received, 652; sent, 642.

June 30, 1875.—Commercial messages received, 1,771; sent, 1,858. Official messages received, 1,605; sent, 1,756.

June 30, 1876.—Commercial messages received, 2,330; sent, 2,478. Official messages received, 2,938; sent, 2,370.

June 30, 1877.—Commercial messages received, 3,062; sent, 3,373. Official messages received, 2,032; sent, 2,169.

Meteorological reports sent to the Office of the Chief Signal-Officer by telegraph June 30, 1876, 190. June 30, 1877, 360.

Tri-daily meteorological reports have been made since September 21, 1875, and the afternoon report has been regularly telegraphed to the Office of the Chief Signal-Officer. The sunset report commenced February 20, 1877.

The following instruments are at station: One barometer, one thermometer, one wind-vane, one rain-gauge, one measuring stick, one maximum thermometer, one minimum thermometer.

SAN DIEGO, CALIFORNIA.

This office was opened November 18, 1873, with Mr. W. E. Smith as manager, who remained in charge until May 22, 1874. His successors have served as follows: Mr. J. B. Smith, May 22, 1874, to February 17, 1875; Mr. J. W. Thompson, February 17, 1875, to March 15, 1875; Sergeant W. T. Blythe, March 15, 1875, to date. The following have been assistants: Private John Carroll, Signal Service, ——— ———, to March 17, 1875; Private H. A. Dusouchet, Signal Service, May 21, 1875, to October 7, 1876; Private William Story, Signal Service, October 7, 1876, to May 1, 1877. The following is a list of detailed men, Department Arizona, who have served at this office: Private J. L. Fritz, Company C, Twelfth Infantry, July 19, 1876, to December 20, 1876; Private K. Schillinger, Company H, Eighth Infantry, December 26, 1876, to June 14, 1877.

The following is an exhibit of the telegraphic business done for the fiscal years ending—

June 30, 1874.—Commercial messages received, 850; sent, 966. Official messages received, 294; sent, 184.

June 30, 1875.—Commercial messages received, 2,265; sent, 2,005. Official messages received, 294; sent, 349.

June 30, 1876.—Commercial messages received, 4,094; sent, 3,206. Official messages received, 434; sent, 469.

June 30, 1877.—Commercial messages received, 5,543; sent, 3,887. Official messages received, 404; sent, 378.

Since December 1, 1875, afternoon meteorological reports have been collected and telegraphed to the Chief Signal-Officer. Since February 20, 1877, sunset reports have been collected and forwarded in like manner. One thousand five hundred and thirteen reports for the year ending June 30, 1876, and 4,494 reports for the year ending June 30, 1877. Six thousand and seven reports were thus concentrated and forwarded during the two years.

From July 1 tri-daily reports will be gathered and forwarded from New Mexico and Arizona Division when they cannot be forwarded by Santa Fé.

STANWIX, ARIZONA TERRITORY.

Mr. J. T. Gifford opened this office in January, 1874, and remained in charge until August 3, 1874. His successors have been Mr. John Carroll, August 3, 1874, to November 10, 1874; Private William E. Guild, Signal Service, November 10, 1874, to June 1, 1876; Sergeant William Phoedovius, Signal Service, June 1, 1876, to July, 1876; and Private W. J. Dailey, Signal Service, September 8, 1876, to date; Private P. G. Butler, Company H, Eighth Infantry, as repairman from November 8, 1875, until May 25, 1877; he was operator in charge also from July, 1876, to September 8, 1876; Private Christian Gall, Company H, Eighth Infantry, May 25, 1877, to date.

The following is an exhibit of the telegraphic work of this office for the fiscal years ending—

June 30, 1874.—Commercial messages received, 12; sent, 24. Official messages received, 2; sent, 6.

June 30, 1875.—Commercial messages received, 63; sent, 91. Official messages received, 7; sent, 18.

June 30, 1876.—Commercial messages received, 137; sent, 237. Official messages received, 26; sent, 28.

June 30, 1877.—Commercial messages received, 109; sent, 230. Official messages received, 14; sent, 43.

Meteorological reports sent to the Office of the Chief Signal-Officer by telegraph June 30, 1876, 139; June 30, 1877, 414.

Tri-daily meteorological reports have been made since January 25, 1876, and the afternoon report has been regularly telegraphed to the Office of the Chief Signal-Officer.

Tri-daily reports by telegraph to Washington have been ordered to commence July 1, 1877. The sunset report commenced February 20, 1877.

The following instruments are on station: One barometer, one thermometer, one wind-vane, one rain-gauge, and one measuring stick.

TRES ALAMOS, ARIZONA TERRITORY.

This office was opened June 11, 1877, by Private Levi Pitts, Signal Service, who remains in charge.

The following is the telegraphic business for the month of June, 1877: Commercial messages received, 4; sent, 4. Official messages received, 5; sent, 6.

TUCSON, ARIZONA TERRITORY.

This office was opened December 2, 1873, by R. H. Howe, who remained in charge until July 11, 1876. His successors were Mr. J. W. Gearheart, July 11, 1874, to December 1, 1874; Mr. John W. Strauchun, December 1, 1874, to January 27, 1875; Private W. C. Barden, Signal Service, January 27, 1875, to date.

The following have been assistant operators: Private William I. Allen, Signal Service, December, 1874, to April 6, 1875; Private W. R. Robinson, Signal Service, July 19, 1875, to October 26, 1875; Private Levi Pitts, Signal Service, from September 8, 1876, to October 23, 1876; Private George V. Phillips, Signal Service, from January 24, 1877, to March 1, 1877; Private C. M. Clark, Signal Service, under orders to office at date. Private C. Butler, Signal Service, has been on duty as repairman since November 13, 1875, to date.

The following detailed men, Department Arizona, have served as repairmen: Private R. Batey, Company B, Sixth Cavalry, August 21, 1876, to ——— ——— ———; Private S. J. Ponteng, Company B, Sixth Cavalry, September 11, 1876, to May 5, 1877; Private W. Clyde, Company B, Sixth Cavalry, May 15, 1877, to date. Private S. Adams, Company H, Sixth Cavalry, as messenger, May 15, 1877, to date.

The following is a summary of telegraphic work for the fiscal years ending—

June 30, 1874.—Commercial messages received, 492; sent, 510. Official messages received, 339; sent, 346.

June 30, 1875.—Commercial messages received, 2,420; sent, 2,395. Official messages received, 567; sent, 564.

June 30, 1876.—Commercial messages received, 4,210; sent, 3,697. Official messages received, 1,252; sent, 1,104.

June 30, 1877.—Commercial messages received, 4,323; sent, 4,223. Official messages received, 600; sent, 592.

Meteorological reports sent to the office of the Chief Signal-Officer by telegraph June 30, 1876, 190; June 30, 1877, 400.

Tri-daily meteorological reports have been made since September 21, 1875, and the p. m. report has been regularly telegraphed to the Office of the Chief Signal-Officer. Tri daily reports by telegraph to Washington have been ordered to commence July 1, 1877. The sunset report commenced February 20, 1877. This station has been obliged

to relay all business passing between stations east and west of it. Nearly three thousand messages were relayed for the year ending June 30, 1876, and over four thousand for the year ending June 30, 1877. Arrangements now pending will soon obviate work of this kind save in very bad weather.

The following instruments are at station: One barometer, one thermometer, one wind-vane, one rain-gauge, one measuring-stick.

YUMA, ARIZONA TERRITORY.

The Yuma office was opened November 18, 1873, by Mr. Thomas E. Atkinson, who remained as manager till July 15, 1874. His successors have been as follows: Mr. John Carroll, July 15 to 26, 1874; Mr. James J. Ashe, July 26 to November 3, 1874; Sergeant E. W. Boutelle, Signal Service, November 3, 1874, to June 19, 1875; Private O. K. Tompkins, Signal Service, June 19, 1875, to May 30, 1876, when he deserted, embezzling a considerable amount of funds and property; Private W. E. Guild, May 31, to August 17, 1876; Sergeant E. W. Boutelle, from August 17, 1876, to March 1, 1877; Private George V. Phillips, from March 1, 1877, to date.

The following have been assistants: Private William T. Burbridge, Signal Service, May 14, 1875, to June 19, 1875; Private O. W. White, Signal Service, June 1, 1877, to date.

The following is a list of detailed men from the Department of Arizona: Private O. Blume, Company H, Eighth Infantry, October 7, 1875, to April 12, 1877; Private C. P. Daley, Company C, Twelfth Infantry, April 17, 1877, to April 25, 1877; Private T. J. Helmsing, Company C, Twelfth Infantry, April 25, 1877, to May 31, 1877; Private C. P. Daley, Company C, Twelfth Infantry, May 31, 1877, to date.

The following is an exhibit of the telegraphic work of the office for the fiscal years ending—

June 30, 1874.—Commercial messages received, 510; sent, 475. Official messages received, 371; sent, 376.

June 30, 1875.—Commercial messages received, 1,836; sent, 1,830. Official messages received, 902; sent, 1,022.

June 30, 1876.—Commercial messages received, 2,211; sent, 2,059. Official messages received, 920; sent, 1,043.

June 30, 1877.—Commercial messages received, 2,568; sent, 2,644. Official messages received, 666; sent, 674.

Meteorological reports sent to the Office of the Chief Signal-Officer by telegraph June 30, 1876, 190; June 30, 1877, 420.

Tri-daily meteorological reports have been made since September 21, 1875, and the p. m. report has been regularly telegraphed to the Office of the Chief Signal-Officer.

Tri-daily reports, by telegraph, to Washington have been ordered to commence July 1, 1877. The sunset report commenced February 20, 1877.

The following instruments are at station: Two barometers, one thermometer, one hygrometer (complete), one anemometer, one wind-vane, one rain-gauge, one measuring-stick, one maximum thermometer, and one minimum thermometer.

WICKENBURG, ARIZONA TERRITORY

This office was opened January 6, 1874, by Mr. J. W. Staucher as manager, who remained in charge until April, 1874. His successors were as follows: Mr. William Elliken, April, 1874, to May 23, 1874; Private John Martin, Company G, Fifth Cavalry, May 23, 1874, to November 11, 1874; Sergeant A. M. Geissinger, Signal Service, November 11, 1874, to January 25, 1875; Private William Ramsay, Signal Service, January 25, 1875, to March 7, 1875; Private John Carroll, Signal Service, March 7, 1875, to April 3, 1876; closed from April 3, 1876, to September 17, 1876. Private William E. Guild, Signal Service, September 17, 1876, to date.

The following repairmen have been on duty at this station: Private J. Bayland, Company K, Sixth Cavalry, July 1, 1876, to May 5, 1877; Private O. Vowles, Company K, Sixth Cavalry, March 3, 1877, to June 30, 1877; Private W. Lange, Company F, Sixth Cavalry, January 21, 1876, ———.

The following is an exhibit of the telegraphic business done for the fiscal years ending—

June 30, 1874.—Commercial messages received, 103; sent, 85. Official messages received, 5; sent, 26.

June 30, 1875.—Commercial messages received, 372; sent, 421. Official messages received, 27; sent, 25.

June 30, 1876.—Commercial messages received, 536; sent, 714. Official messages received, —; sent, 17.

June 30, 1877.—Commercial messages received, 664; sent, 850. Official messages received, 25; sent, 64.

Meteorological reports sent to the Office of the Chief Signal-Officer by telegraph June 30, 1876, 146; June 30, 1877, 461.

Tri-daily meteorological reports have been made since January 28, 1876, and the p. m. report has been regularly telegraphed to the Office of the Chief Signal-Officer. The sunset report commenced February 20, 1877.

The following instruments are at station: One thermometer, one hygrometer (complete), one wind-vane, one rain-gauge, one measuring-stick, one maximum thermometer, and one minimum thermometer.

WEST INDIAN STATIONS.

Telegraphic reports have not been received from the West Indian stations during the year ending June 30, 1877. Mail reports have been received from Bermuda to September 23, 1876; Clifton, Jamaica, to March 31, 1877; and Kingston, Jamaica, to June 30, 1877.

BRITISH AMERICAN STATIONS.

YORK FACTORY, HUDSON BAY TERRITORY.

[*Official number*, 11.]

Latitude	57° 2′
Longitude	92° 26′

The last mail reports received from this station are dated December 2, 1876.

DOMINION OF CANADA.

Telegraphic reports have been regularly received during the year from the stations named below, after concentration at the central office of the Dominion meteorological system in Toronto.

CHATHAM, NEW BRUNSWICK.

[*Official number*, 2.]

Latitude	47° 1′
Longitude	65° 30′

Three observations are taken daily at hours synchronous with the telegraphic series taken in the United States, and are forwarded regularly to the office of the Chief Signal-Officer tri-daily by telegraph, and weekly by mail, on Form 1 (Canadian).

FATHER POINT, QUEBEC.

[*Official number*, 5.]

Latitude	48° 31′ 25″
Longitude	68° 27′ 40″

Three observations are taken daily at hours synchronous with the telegraphic series taken in the United States, and are forwarded regularly to the office of the Chief Signal-Officer tri-daily by telegraph, and weekly by mail, on Form 1 (Canadian).

FORT GARRY, MANITOBA.

[*Official number*, 88.]

Latitude	49° 52′
Longitude	97° 0′

Three observations are taken daily at hours synchronous with those

of the telegraphic series taken in the United States, and are forwarded regularly to the office of the Chief Signal-Officer tri-daily by telegraph, and weekly by mail, on Form 1 (Canadian).

HALIFAX, NOVA SCOTIA.

[*Official number*, 89.]

Latitude	44° 39′ 20″
Longitude	63° 36′ 40″

Three observations are taken daily at hours synchronous with those of the telegraphic series taken in the United States, and are forwarded regularly to the office of the Chief Signal-Officer tri-daily by telegraph, and weekly by mail, on Form 1 (Canadian).

KINGSTON, ONTARIO.

[*Official number*, 80.]

Latitude	44° 12′
Longitude	75° 41′

Three observations are taken daily at this station at hours synchronous with those of the telegraphic series taken in the United States, and are forwarded regularly to the office of the Chief Signal-Officer tri-daily by telegraph, and weekly by mail, on Form 1 (Canadian).

MONTREAL, QUEBEC.

[*Official number*, 56.]

Latitude	45° 31′
Longitude	73° 33′ 14″

Three observations are taken daily at hours synchronous with those of the telegraphic series taken in the United States, and are forwarded regularly to the office of the Chief Signal-Officer tri-daily by telegraph, and weekly by mail, on Form 1 (Canadian).

OTTAWA, ONTARIO.

[*Official number*, 101.]

Latitude	45° 25′ 32″
Longitude	75° 42

Three observations were taken daily at hours synchronous with those of the telegraphic series taken in the United States, and were forwarded regularly to the central office tri-daily by telegraph, and weekly by mail, on Form 1 (Canadian). This station discontinued reporting by telegraph December 31, 1876, and by mail March 3, 1877.

PARRY SOUND, ONTARIO.

[*Official number*, 108.]

Latitude	45° 22′
Longitude	80° 12′ 45″

Three observations are taken daily at hours synchronous with those of the telegraphic series taken in the United States, and are forwarded regularly to the office of the Chief Signal-Officer tri-daily by telegraph, and weekly by mail, on Form 1 (Canadian).

PORT DOVER, ONTARIO.

[*Official number*, 79.]

Latitude	42° 47′
Longitude	80° 13′

Three observations are taken daily at hours synchronous with those of the telegraphic series taken in the United States, and were forwarded regularly to the office of the Chief Signal-Officer tri-daily by telegraph until July 31, 1876, when the telegraphic reports were discontinued, but are still sent weekly by mail, on Form 1 (Canadian).

PORT STANLEY, ONTARIO.

[*Official number*, 78.]

Latitude	42° 40′
Longitude	81° 13′ 30″

Three observations are taken daily at hours synchronous with those of the telegraphic series taken in the United States, and were forwarded regularly to the office of the Chief Signal-Officer tri-daily by telegraph until July 31, 1876, when the telegraphic reports were discontinued, but are still sent weekly by mail, on Form 1 (Canadian).

QUEBEC, QUEBEC.

[*Official number*, 57.]

Latitude	46° 48′
Longitude	71° 12′

Three observations are taken daily at hours synchronous with those of the telegraphic series taken in the United States, and are forwarded regularly to the office of the Chief Signal-Officer tri-daily by telegraph, and weekly by mail, on Form 1 (Canadian).

ROCKLIFFE, ONTARIO.

[*Official number*, 7.]

Latitude	46° 10′
Longitude	77° 45′

This station commenced reporting by mail on January 1, 1877, and by telegraph January 17, 1877.

Three observations are taken daily at hours synchronous with those of the telegraphic series taken in the United States, and are forwarded regularly to the office of the Chief Signal-Officer tri-daily by telegraph, and weekly by mail, on Form 1 (Canadian).

SAUGEEN, ONTARIO.

[*Official number*, 81.]

Latitude	44° 40′
Longitude	81° 10′

Three observations are taken daily at hours synchronous with those of the telegraphic series taken in the United States, and are forwarded regularly to the Office of the Chief Signal-Officer tri-daily by telegraph and weekly by mail, on Form 1 (Canadian).

SYDNEY, CAPE BRETON.

[*Official number*, 6.]

Latitude	46° 12′
Longitude	60° 12′

Three observations are taken daily at hours synchronous with the telegraphic series taken in the United States, and are forwarded regularly to the Office of the Chief Signal-Officer tri-daily by telegraph and weekly by mail, on Form 1 (Canadian).

TORONTO, ONTARIO.

[*Official number*, 58.]

Latitude	43° 39′ 4″
Longitude	79° 23′ 15″

Three observations are taken daily at hours synchronous with those of the telegraphic series taken in the United States, and are forwarded regularly to the Office of the Chief Signal-Officer tri-daily by telegraph and weekly by mail, on Form 1 (Canadian).

Mail reports have been received from the following stations:

CHARLOTTETOWN, PRINCE EDWARD ISLAND.

[*Official number*, 127.]

Latitude	46° 14′
Longitude	63° 10′

Three observations are taken daily at hours synchronous with the telegraphic series taken in the United States, and are sent by mail to the central office, weekly, on Form 1 (Canadian).

BROCKVILLE, ONTARIO.

[*Official number*, 126.]

Latitude	44° 34′
Longitude	75° 51′

Three meteorological observations are taken daily at a. m. and p. m., at hours synchronous with the telegraphic series taken in the United States, and the other at 9 p. m., local time, and are sent to the Office of the Chief Signal-Officer by mail, weekly, on Form 1 (Canadian).

STAYNER, ONTARIO.

[*Official number*, 128.]

Latitude	44° 25′
Longitude	80° 15′

Two observations are taken daily, except Sunday, and are synchronous with the morning and afternoon observations of the telegraphic series taken in the United States, and are forwarded to the Office of the Chief Signal-Officer weekly, by mail, on Form 1 (Canadian). No telegraphic reports are sent.

SAINT JOHN'S, NEWFOUNDLAND.

[*Official number*, 10.]

Latitude	44° 17′
Longitude	66° 3′

The Hon. John Dulaney, postmaster-general of Newfoundland, reports on Form 4, weekly, three observations a day, two of which (the a. m. and p. m.) are synchronous with the telegraphic observations taken at Washington at 7.35 a. m. and 4.35 p. m., and the other at 9.12 p. m., local time.

PUBLICATIONS.

[*Year ending June* 30, 1877.]

Maps (printed)	124,548
Farmers' Bulletins	2,024,294
Bulletins (manifold)	258,154
Form 15 (manifold)	64,621
Form 22	5,074
Form 26	38,745
Local Reports	38,424
Weekly Chronicles	4,453
Monthly Weather Reviews	11,317
International Bulletins	97,630
Total	2,667,260

GENERAL SUMMARY.

UNITED STATES STATIONS.

Number of regular stations making full telegraphic reports tri-daily	82
Number of regular stations making one full report by telegraph daily	1
Number of regular stations making one partial report by telegraph daily	2
Number of regular stations taking observations daily and reporting by mail	11
Number of printing stations at which observations are not taken	3
Number of regular stations established during June, 1877, and to commence making full reports by telegraph July 1, 1877	10
	109
Number of regular stations discontinued during the year	9
Number of stations on United States military telegraph lines reporting tri-daily by telegraph	10
Number of stations on United States military telegraph lines reporting twice daily by telegraph	1
Number of stations on United States military telegraph lines reporting once daily by telegraph	29
Number of stations on United States military telegraph lines which do not make meteorological observations	10
	50
Special river stations	23
Total stations	182

WEST INDIAN STATIONS.

Number of stations making full reports by mail	1

CANDIAN AND BRITISH AMERICAN STATIONS.

Number of stations from which telegraphic reports are received	12
Number of stations from which mail reports only are received	7
Total	19

A portion of the meteorological statistics for the year, as had from the regular reporting stations, are given in papers 16 to 20. One hundred and thirteen stations have been inspected during the year, of which number twenty have been inspected twice. Paper 9 shows the name of each station inspected, with the dates of inspection. The inspection of stations was suspended July 1, 1877, there being at that date no appropriation available for the payment of the traveling expenses of the officers.

The average cost of maintaining each station of observation and report during the year, exclusive of the cost for telegraphing the reports and of the pay and maintenance of the men on duty at each, has been $358.08. The average of force employed at the stations referred to, or on duty connected therewith, has amounted to one and four-tenths men for each station. In the cost of each station, as here given, is included the cost of rent and of maintaining a suitable office or room at each place for the public use, with facilities for the necessary exposure of instruments and for the display of cautionary signals, where such signals are required.

The duties of the enlisted men at each station are as follows: At stations forwarding telegraphic reports they are required to take, put in cipher, and furnish, to be telegraphed tri-daily on each day, at different fixed times, the results of observations made at those times, and embracing, in each case, the readings of the barometer, the thermometer, the wind-velocity and direction, the rain-gauge, the relative humidity, the character, quantity, and movement of upper and lower clouds, and the condition of the weather. These observations are taken at such hours, at the different stations, as to provide the three simultaneous observations, taken daily at three fixed moments of physical time (7.35 a. m., 4.35 p. m., and 11 p. m., Washington mean time,) throughout the whole extent of the territory of the United States. The differences between these fixed times and the local times at the different stations cause it to happen that at some stations the observations are to be made in the earliest hours of the morning, and at others in the latest of the night. The work thus practically extends throughout the twenty-four hours. Each of these observations is required to be carefully recorded, for future reference, at the time it is taken. Three other observations to be taken at the local times, 7 a. m., 2 p. m., and 9 p. m., are also taken and recorded at each station. A seventh and especial observation is taken and recorded at noon on each day. If at this observation such instrumental changes are noted as to cause anxiety, the fact is to be telegraphed to the central office at Washington.

An eighth observation is required to be taken at the exact hour of sunset at each station. This observation, embracing the appearance of the western sky, the direction of the wind, the amount of cloudiness, the readings of the barometer, thermometer, and hygrometer, and amount of rain-fall since last preceding report, is reported with the midnight report.

At the stations at which cautionary signals are displayed an observer must be constantly on duty to receive the order and to show the signal, which may be ordered at any moment. At stations from which river-reports are furnished, an observation and record of the depth and temperature of the water is made and reported at 3 o'clock p. m., local time, on each day. In the cases of threatening storms or dangerous freshets, any station may be called upon to make hourly reports.

The data thus gathered on the files at each station are to be consolidated, first weekly, on forms which, with copies of the telegraphic-

cipher report, are to be sent weekly to the central office, then monthly, in the form of a careful digest, also to be forwarded. The thorough study of the work of the month is then to be condensed in the form of a monthly chart. None of these observations or records ought to be dispensed with, nor can they, with meteorological instruments as they now exist, be taken and recorded more economically. At stations where the population warrants it the duties of the enlisted men are increased by the receipt and record of data from other stations, to be exhibited upon written bulletins or furnished to the press for public use. In the great cities there are the further duties of the display, at the rooms of the boards of trade, chambers of commerce, and other similar places, of symbol-maps on which the meteoric conditions are shown by symbols changeable daily.

The local offices of the Signal Service are always places of resort for inquiry on the part of those desiring to be informed what changes of weather have been particularly noticed or are likely to affect the various industries in which the populations are engaged.

In the cities upon the sea-coasts of the United States, or at the lake ports, the offices of the service are open for the comparison of instruments, the examination of their data, or to furnish whatever information may be practicable to captains of vessels or others concerned in shipping interests. At stations upon telegraphic lines in charge of or constructed by the service in pursuance and furtherance of its duties, the ordinary duties of telegraphing and the maintenance of the lines devolve upon the force so stationed, in addition to duties of observation. The cautionary-signal flag is always, when flown and officially, an invitation to mariners or others interested to visit the offices for information of this character. The courtesies and duties of the office are not limited to the United States people alone, but are freely tendered to the people of any nation who may be within our borders.

The distribution of farmers' bulletins for the uses of agricultural populations has been frequently and is elsewhere described.

The forms exhibiting, condensed, the labor thus required of Signal-Service men stationed at separate stations, and the instructions under which the separate observations and reports are made, are herewith described. (Paper 21.)

In times of especial emergencies, or of danger of any kind threatening the separate States or the United States, the different stations make, by order and in cipher, regular reports upon any subject under the attention of superior authorities.

The enlisted men in charge of stations are responsible for the care, cleanliness, and good working of the instruments, the clearness of the records, the correctness and punctuality of reports, the display of signals or bulletins, and, in fine, for the conduct and good condition of the station itself. It has been considered necessary to make this description thus minute that it might be understood what duties are required of the non-commissioned officers and privates of the Signal Service in addition to the military duties heretofore referred to, and that it may be comprehended that the force must consist of men of more than ordinary acquirements to be competent for them.

The sum of their pay and allowances scarcely compensates for the continuous labor of such a character.

This sum, made up in the several cases of the pay proper, extra-duty pay, commutation for rations, fuel, and quarters, appears in paper 22, herewith. It comprehends every allowance which is permitted the soldier to house, feed, and clothe himself; to meet, in fine, every expense

of his maintenance wherever in the wide extent of the territories of the United States the vicissitudes of the service may call him. It must be borne in mind that he can have no home, and must purchase anew, with every change of station, the little comforts which homes gather around them. These men are soldiers. At the time of serious disturbances, occurring since the date of the last annual report, an armed detachment of the corps, equaling in strength that of the average company, was, with its officers, held ready for some days for service at a moment's warning.

The laws of the United States provide, as yet, no promotion in the line of their duty for the men who exhaust the vigorous years of their lives in these duties.

The work of a plan of observation and report, extending by its different branches and connections around the northern hemisphere, and which ceases at no hour of the day or night, is thus secured through the service of one hundred and fifty sergeants, thirty corporals, and two hundred and twenty privates. The force is less than the military force of non-commissioned officers and privates employed in the duties of charting, engineering, observing, and duties of a similar character in the rigidly managed armies of Great Britain, Austria, or Russia. It is not necessary, with such facts in view and after seventeen years of continuous service, to reiterate the advantages secured to the Signal Service by its military organization. Service under military organization is that form of a permanent civil service of disciplined citizens in which the duties are compulsory for the term of the service, and a proper discharge of them can be enforced by punishment. The experience of centuries has proven that whenever tasks covering in their reach the extent of nations, and involving in their execution interests of life and property, are to be undertaken, men have sought, as if by instinct, for faithful co-operation and prompt action through the regular control and sure reward or punishment which attend the military system. The soldiers of the United States are simply its citizens, held under what ought to be wise rules and regulations to duties which they have voluntarily accepted.

The Military School at West Point would be useless, so far as its extended course of study is concerned, if the officers thence graduated were not intended to be employed on duties requiring scientific culture.

The duties of an army in time of peace have been defined as properly limited in their exercise to those of a police force for the nation. It is considered that those rendered by the Signal Service have demonstrated that the men carried upon its rolls have been able to perform these duties and others requiring a higher standard of attainment and rendering a better equivalent for the necessary cost. They have not failed to be ready to act as an armed police upon any intimation that there was need of such readiness.

The detail of the duties at stations for the year ending June 30, 1877, and the distribution of the enlisted men as stationed at the several stations, is given at length in the record of stations.

In reviewing the duties performed at the Office of the Chief Signal-Officer at the War Department, it ought to be borne in mind that they are continued day and night, without cessation for holidays or days of rest, and that they must of necessity and for this reason be performed by details of men who relieve each other at fixed times.

In estimating the numbers required to be present for duty, it is difficult to make a comparison between an establishment thus conducted and others in which the work is limited to certain hours of daylight only. This office is the center to which the daily, weekly, and monthly contri-

butions of all other offices or stations of the Signal-Service scattered throughout the United States tend to be daily condensed, and finally elaborated and made of practical value. There are here concentrated, also, the reports from the five hundred and sixty places at which voluntary reports of daily observations are now made on this continent, and from the two hundred and ninety-three locations in foreign countries from which reports of daily simultaneous observations are had. From the great mass of data thus collected, and which enhances each year in value, are continuously elaborated, the results which appear in the different publications of the office, whether in the form of forecasts telegraphed to the press throughout the country, of charts or bulletins distributed hence, of generalizations announced as apparent, of cautionary-signal orders, or of the weekly and monthly publications. No single report of any observation received at the office fails to receive attention or study.

The regular exchange of telegraphic reports, had by comity of exchange with the chief meteorological office of the Dominion of Canada, has been continued. Meteorological reports, furnished according to the form of this office, have been received by telegraph tri-daily from twelve stations within the Dominion, and warnings have been regularly transmitted to the meteorological office of the Dominion, at Toronto, as affording material on which to base the display of signals to be exhibited at ports of the Dominion at times of threatened danger. The telegraphic reports of observations received from twenty-six Signal-Service stations of the United States, have been furnished thrice-daily to the agent of the Dominion office, at Buffalo, N. Y. The relations thus maintained between the two services continue to be of benefit to both.

While this office has been prepared to co-operate in this manner with any foreign office, and to the limit of its power in the furnishing of material for study, by the use of its consolidated reports or by especial warnings, it is not authorized by law to co-operate with any institution or party for the publication or display of forecasts, indications, or cautionary signals not emanating from this bureau, or so controlled by it as not to conflict with or confuse those hence issued for the Territories of the United States, the lakes, rivers, or coasts in or bordering upon them.

The series of telegraphic reports from stations in the West Indies, extending from Cuba by Jamaica to Barbadoes and the Windward Islands, referred to in previous reports, has, in view of the small appropriations available, been suspended.

It is in contemplation, until larger sums are at command, to call for telegraphic reports from these stations during those months only during which especial danger threatens the Gulf of Mexico and the coasts of the United States from the march of cyclones, here often first detected.

While the defective working of the telegraphic cables has frequently impaired the value of these reports by delay, and it is difficult to secure the services of reliable observers, they are at times very useful.

In recurring instances hurricanes, which for days after moved near our Gulf and Atlantic coasts, have been heralded by them, and the cautionary signals of the service have been kept displayed at ports at which the weather was fair, while dangerous hurricanes in progress at sea menaced everything which might sail from them. The great expense of the telegraphic transmission, which has hitherto rendered extensive systems of West India reports too costly to be attempted, has been greatly lessened since the date of the last annual report by the wise liberality of the officers of the West India and Panama, and the Cuban Submarine Telegraph Companies, who, recognizing the international char-

acter of the work, have reduced the rates for the reports intended for this office, the former transmitting them at the rate of one-third and the latter at one-half the cost of commercial messages. The sums charged are still quite large for continuous work, amounting in some instances to one dollar per word.

The Chief Signal-Officer is able to announce, for the first time, in this report the net-work of stations of the Signal Service as extending now, though in some districts by stations far too widely separated, to both the Atlantic and Pacific coasts of the continent and over the intervening territory of the United States. The work of the stations has been rendered fairly utilizable for the daily prevision of meteoric changes to occur over this whole geographical extent, including the great interior plateau.

The service now has its stations located in continuous lines along the Eastern and Atlantic coast; along the Southern or Gulf coast; along the southwestern boundary, separating the United States from Mexico to the Pacific Ocean; thence northerly along the Pacific coast to British North America, and at selected points throughout the whole interior within these bounding lines. Whenever a continuous telegraphic line shall follow the line by which the United States bound on British North America from the Pacific Ocean to Lake Superior, it will be the work of a few days only to complete the northern circuit of stations as rapidly as added. As telegraphic lines extend within the bounding lines above referred to, they will make possible the establishment of other and much-needed interior stations. The experience of years has reduced the matter of opening, equipping, and rapidly utilizing stations of observation and report to a system.

The following list exhibits the stations as classified and as located in States and Territories:

Alabama.—Mobile,* Montgomery.* *Alaska.*—Fort Saint Michaels,* Saint Paul's Island.* *Arizona.*—Camp Bowie,§ Camp Goodwin,§ Florence,* Maricopa Wells,* Camp Verde,* Phœnix,* Prescott,* San Pedro,§ Stanwix,* Camp Grant,* Tres Alamos,§ Tucson,* Wickenburg,* Yuma.* *British Columbia.*—Lytton,† New Westminster,† Vancouver's Island.† *California.*—Los Angeles,* Red Bluff,* Sacramento,* San Diego,* San Francisco,* Visalia,* Campo, Monterey,† Santa Barbara,† Yreka.† *Colorado.*—Denver,* Pike's Peak,* Kit Carson,† Trinidad.† *Connecticut.*—New Haven,* New London.* *District of Columbia.*—Washington.* *Dakota Territory.*—Bismarck,* Fort Sully,* Pembina,* Yankton,* Deadwood.† *Florida.*—Jacksonville,* Key West,* Punta Rassa,* Saint Marks.* *Georgia.*—Augusta,* Savannah,* Tybee Island.* *Idaho Territory.*—Boise City.* *Illinois.*—Cairo,* Chicago.* *Indiana.*—Logansport, Indianapolis.* *Indian Territory.*—Fort Gibson.* *Iowa.*—Burlington,* Davenport,* Dubuque,* Keokuk,* Des Moines.† *Kansas.*—Dodge City,* Leavenworth,* Waterville.† *Kentucky.*—Louisville.* *Louisiana.*—New Orleans,* Shreveport.* *Maine.*—Bangor, Eastport,* Portland.* *Maryland.*—Baltimore.* *Massachusetts.*—Boston,* Springfield,* Thatcher's Island,* Wood's Holl.* *Michigan.*—Alpena,* Detroit,* Escanaba,* Grand Haven,* Marquette,* Menomonee,‡ Port Huron,* Sault de Ste. Marie.† *Minnesota.*—Breckenridge,* Duluth,* Saint Paul,* Wadena.† *Mississippi.*—Vicksburg.* *Missouri.*—Saint Louis.* *Montana Territory.*—Virginia City,* Fort Shaw.† *Nebraska.*—North Platte,* Omaha.* Central City,† Sydney.† *Nevada.*—Pioche,* Winnemucca,* Austin,† Hamilton.† *New Hampshire.*—Mount Washington.* *New Jer-*

* Stations of first class. † Sun-set stations. ‡ Display stations. § Repair stations.

sey.—Atlantic City,* Barnegat,* Cape May,* Sandy Hook.* *New York.*—Albany,* Buffalo,* New York,* Rochester,* Oswego,* Elmira.† *New Mexico.*—Albuquerque,* Belen,§ La Mesilla,* Santa Fé,* Silver City* (Fort Bayard). *North Carolina.*—Cape Hatteras,* Cape Lookout,* Kittyhawk,* New River Inlet,§ Portsmouth,* Smithville,* Wilmington.* *Ohio.*—Cincinnati,* Cleveland,* Sandusky,* Toledo.* *Oregon.*—Portland,* Roseburg,* Umatilla,* Eugene City.† *Pennsylvania.*—Erie,* Philadelphia,* Pittsburgh.* *Rhode Island.*—Newport.* *South Carolina.*—Charleston.* *Tennessee.*—Knoxville,* Memphis,* Nashville.* *Texas.*—Boerne,* Brackettville,* Brownsville,* Cambridge,* Castroville,* Coleman City,* Concho,* Corsicana,* Decatur,* Denison,* D'Harris,§ Eagle Pass,* Edinburg,* Fredericksburg,* Galveston,* Graham,* Griffin,* Indianola,* Jacksborough,* Laredo,* Mason,* McKavett,* Pilot Point,* Rio Grande City.* San Antonio,* Stockton,* Uvalde.* *Utah Territory.*—Salt Lake City.* *Vermont.*—Burlington.* *Virginia.*—Cape Henry,* Lynchburg,* Norfolk.* *West Virginia.*—Morgantown.* *Washington Territory.*—Olympia.* *Wisconsin.*—Clay Banks,‡ Green Bay,‡ Kenosha,‡ Kewaunee,‡ Manitoba,‡ Milwaukee,* La Crosse,* Racine,‡ Sheboygan,‡ Sturgeon Bay.‡ *Wyoming Territory.*—Cheyenne.* Deep Creek,† Fillmore City,† Fort Fetterman,† Hat Creek,† Saint Mary's†.

Map 1 exhibits the locations of stations and the territory brought by them under constant observation for the purposes of study.

The territory of the United States is not yet covered by the located stations as fully as it ought to be, and valuable opportunities for study, which must be made good hereafter and at an increased expense, are lost.

Experience warrants the statement that the estimated amount needed to be appropriated for this service, the sum of $350,000, could be wisely expended, and a working force of four hundred and fifty men would be properly employed. The reports of observations had in ceaseless succession from the stations already established, while daily and primarily employed in the studies needed for the daily issuing of forecasts and the display of cautionary signals, form also the bases for future work, to be of equal value with that made possible by the first use of them, and constitute a record, to increase in worth hereafter with every year for which it is continued.

The data already secured are worth to the country and to the world, even if the service had up to this time rendered no other return, all it has cost to obtain them.

From the moment at which it is made each of the reports becomes to some extent complementary to all other reports had elsewhere. It is not possible to break this connection, nor in the present state of meteorological science ought any good report to be dispensed with.

It will be found with the lapse of years such observations have settled, by facts, questions hitherto treated by theory only.

It is upon the data now accumulating upon the files of this office and there daily compared, compiled, and treated with an accuracy each year increased by experience, and becoming more rigid as the office is warned, sometimes by notable inaccuracies elsewhere occurring, that the future studies of the climatology and meteorology of this continent will be based. It seems not impossible that upon the results of systems of observations here set on foot will be founded such studies for the northern hemisphere. It is not to the discredit of the United States that a work set on foot by them should render such ends possible.

* Stations of first class. † Sun-set stations. ‡ Display stations. § Repair stations.

The permanence, regularity, and accuracy of reports to be had from the West Indies ought to be secured. No system providing warnings for the Gulf or Atlantic coasts can be considered as complete or reliable without the means of continued reports of observations, to be made from these stations. It seems to be established that the great cyclones originating within the tropics rarely, if ever, reach any coast of the United States without such indications of their existence and of their line of movement as well-managed stations among these islands would detect and announce. It is not known that any severe storm has visited our coast south of Cape Hatteras during the past summer without some premonition from this quarter. The possibility of protection will be increased and extended to more northern coasts whenever telegraphic communication can be had with the Bermuda Islands.

It was found necessary to suspend, during the fiscal year ending June 30, 1876, for economic reasons, several stations which had before been maintained at colleges, scientific institutions, or places from which it seemed desirable that series of reports should be had. These reports of observations, while forming a part of the system adopted for study at this office, would afford a basis for judging of the climatology and of the meteorological facts relating to the interests of the sections in which the stations had been established.

They were some of them also located in States which had no other stations. It is considered but just that as each State contributes its quota to the support of the service there should be some representation of the service in every State. None of the stations abandoned have been reoccupied. It is greatly to be desired that the separate States should so arrange that series of observations, including the tri-daily simultaneous observations, and to be in connection with the duties of this office, should be taken at the county-town of each county in each State. A plan for the arrangement of instruments, now nearly completed at this office, would render this work practicable.

The attention of the office has continued to be directed, during the past year, to the solution of the very difficult question as to the best mode by which to compare, for the purposes of the necessary daily studies, the observations of meteoric changes taking place upon the Pacific coast, near the sea-level, and on the great elevated plateau of the interior, with the reports of observations had on the eastern slope of the Rocky Mountains, and extended to the Gulf and Atlantic coasts at the sea-level. The plans for the tri-daily charts for use in the study-room of the office exhibit a progress in this direction. It is found not difficult to extend some of these charts from the Pacific to the Atlantic coasts at the times of each tri-daily report, with the lines of the charting in so far accurate as to afford very valuable suggestions as to the changes approaching.

The forward march of civilization over the great interior plateau west of the Mississippi, each year renders more extended observation practicable in that region.

The field of study has been pushed in that direction as rapidly as the means at the disposal of the office have permitted. The barometrical readings made in this region still lose part of their value by the difficulty of reduction to the hypothetical readings at sea-level. There seems, however, no longer reason to apprehend that the unreduced readings cannot be utilized for purposes to which the reduced only have been here hitherto applied. It is, perhaps, by multiplying stations and continuing the comparison of observations had at them, the correct solutions of all problems will be most rapidly attained.

The long-felt need of carefully studying the changes going on upon this plateau, and with the insufficient means at the control of this office, has led to the establishment, since the date of the last annual report, of a series of observations had at what are known as "sunset" stations. The circular (Paper 23) sufficiently describes the duties of the employed observers at these stations and the character of the report to be had from them. The observations themselves are roughly spectroscopic, the sunset report being based on such different appearances of the sun and of the effects produced by its rays as are caused by their passage through differently conditioned atmospheric media. It is one of the advantages that the necessary observations are so little complicated in their character that they may be taken at and reported from any point reached by the telegraphic wires. It seems probable that a simple form of spectroscope may be utilized for observations of this sort. Map 7 exhibits the method of charting the sunset reports. These reports are found of value in often-recurring instances in which they furnish some indication of the atmospheric changes in progress at points from which it has been impossible to obtain the full report of observation.

It has been found that a certain accuracy of prediction of the local changes to occur within a period of twenty-four hours is attainable by the local observers, the sergeants of the Signal Service, charged with the making of the sunset reports; these sergeants having the use of instruments, and access to a portion of the data which pass their stations on their way to this office. This accuracy has reached, as computed from the records on file, a maximum percentage of eighty-three for the regions west of the Mississippi Valley, where the weather conditions are notably constant, and one of eighty per cent. for the regions east of the western bounds of that valley. The percentage of "doubtful" reports was one and one half for the region east of the Mississippi Valley, and three and one-half for the region west of it.

There appears to be no reason that any intelligent farmer, supplied with the necessary simple instrument, habituated to similar observations, and furnished with data, either in figures or condensed by charts, as it is believed they readily may be through the press, should fail to attain an equal accuracy.

The usefulness for meteorological purposes of the sea-coast stations of the Signal Service, in connection with the life-saving service, and located at the life-saving service stations, has continued to be demonstrated.

As explained in earlier reports, the observations taken at these stations have the advantage of being taken on the sea-coast itself, and from positions which permit the condition of the sea-swell to be reported. The stations have the further advantage of being directly connected with this office by the telegraphic lines under its control. Report of any character can so be had at any hour they may be called for, or signals may be displayed to warn of danger.

The facilities afforded by these lines admit of conversations even being had, as they frequently are, in reference to meteorological changes or other matters of interest, as, for instance, of the precautions to be taken by those engaged in the salvage of wrecked ships, or other action in cases of shipwreck. The reports of observations had upon the sea-coast itself, or upon the ocean-beach, differ frequently and markedly from those had from stations farther in the interior, and suggest the approach of weather conditions which, without such indications, might either have escaped attention, or could not have been observed in time.

The generalizations had from the reports received from these stations become each year of increasing value for the prediction of the weather

conditions to be expected near our coasts. The reports themselves, published in the daily journals, and so known to those interested, either at the several ports or in the interior, give reliable information as to the circumstances under which coasting-voyages may be undertaken or are being made. The benefits to follow a sea-coast service, with its stations prepared and equipped as these stations show one may be, are such as cause it to be hoped that all the exposed and frequented coasts of the United States may early have the advantage of such protection.

It is considered to have been demonstrated that, by the services of single sea-coast stations, there has been saved, at different times, property amounting in value to more than the cost of manning and maintaining all the stations from the dates at which they were first put in operation. Improving modes of communication promise as possible such close connection between the stations that it seems practicable to so arrange that there need be no points upon our coasts but to which aid can be almost immediately summoned, and none but from which summons for aid can go, if need be, to naval stations, ports, or cities. The uses to follow the establishment of these stations are yet in the infancy of their development. The sad instance of the loss of the United States steamship Huron, reported as this paper goes to the printer, evidences their usefulness and that it is a duty to increase their number.

The stations on the telegraphic lines, constructed in pursuance of acts of Congress in the Southwest and on the Indian and Mexican frontiers, and for the purpose of connecting military posts and stations, serve better each year the ends for which, in part, the lines were at first recommended —that of extending the fields of meteorological research over regions so sparsely settled as to be almost beyond the limits of civilization.

They have made possible the daily receipt of meteorological data from regions in which the collection of them had been before considered so impracticable as to have been hardly contemplated, and they have furnished for the office a daily knowledge of the atmospheric conditions existing along the whole course of the wires. The value of these reports, completing as they do the southern line of the whole system of reports established for the territory of the United States, and which, without them, could not have been completed, is very great. The lines make practicable also the receipt at the regular telegraphic stations of reports from points in the interior of the country near them which has been but recently explored, and from which every reported observation is valuable. The sooner a line, to be similarly constructed and managed, is extended along our northern frontier, from stations in Northwestern Oregon eastward to the station at Bismarck, the better for the interests of the service and for the protection and development of that portion of our territory. The events of the past summer have illustrated the uses of such a line which would have important influence in Indian wars.

Reports from the eastern Mexican coast (the western coast of the Mexican Gulf) are still to be desired for the proper protection of the shipping in the Gulf and of the Gulf coasts of the United States. Cyclones moving over the West Indies, and thence pursuing a course over the Gulf of Mexico, would doubtless often manifest themselves on or near the coast of Mexico in time to permit warnings to be thence given to our own. The regularity of the telegraphic communication now had over the government lines upon the Mexican frontier and in the State of Texas has established the fact that reports collected in Mexico along or near the Mexican coasts, and transmitted over wires working with fair success, could be concentrated at this office with sufficient rapidity. The notices for the display of cautionary signals could reach Mexican ports as well as our own.

The proposition adopted at the congress of persons charged with meteorological duties, assembled at Vienna in 1873, and to the effect that it is desirable, with a view to their exchange, that at least one uniform observation, of such character as to be suited for the preparation of synoptic charts, be taken and recorded daily and simultaneously at as many stations as practicable throughout the world, has continued to have practical effect.

By authority of the War Department, and with the courteous co-operation of scientists and chiefs of meteorological services representing the different countries, a record of observations, taken daily sumultaneously with the observations taken throughout the United States and the adjacent islands, is exchanged semi-monthly. These reports are to cover the territorial extent of Algiers, Austria, Belgium, Great Britain, Central America, Denmark, France, Germany, Greece, East Indies, Italy, Japan, Mexico, The Netherlands, Norway, Portugal, Russia, Spain, Sweden, Switzerland, Turkey, British North America, the United States, the Azores, the Bermudas, the Aleutian Islands, Sandwich Islands, West Indies, and South America.

The daily issue of a printed bulletin, exhibiting these international simultaneous reports, commenced at this office in 1875, has been since maintained. A copy of this bulletin is furnished each co-operating observer. The results to be had from the reports thus collated are considered to be of especial importance. The bulletin combines, for the first time of which there is record, the labors of the nations in a work of this kind for their mutual benefit. There is needed only the assistance to be had from the naval forces of the different powers, that of the Navy of the United States being, as heretofore related, already given, to extend the plan of report upon the seas; to bring within the scope of study observations sufficiently numerous and extending around the northern hemisphere. This assistance is understood to be already promised by some of the greatest naval powers.

In this connection the office has to acknowledge the cordial and valuable co-operation of the meteorological services of the different countries, represented as follows:

Algiers, by General Teissier, commandant superior du génie; Austria, by Prof. Dr. Julius Hann, director of the Imperial and Royal Central Meteorological Institute at Vienna; Belgium, by J. C. Houzeau, director of the Royal Observatory at Brussels; Great Britain, by Mr. Robert H. Scott, director of the Meteorological Office, London, Alexander Buchan, secretary of the Scottish Meteorological Society, Edinburgh, and the respective observers; Costa Rica, by Senor Federico Maison, director of the Central Office of Statistics and Meteorology; Denmark, by Capt. N. Hoffmeyer, director of the Royal Danish Meteorological Institute at Copenhagen; France, by U. J. Le Verrier, director of the Paris Observatory, and the respective observers; Germany, by Prof. Dr. Geo. Neumayer, director of the German Naval Observatory, Hamburg; Greece, by Prof. Dr. J. F. Julius Schmidt, director of the Royal Observatory at Athens; India, by H. F. Blanford, meteorological reporter to the Government of India; Italy, by the minister of agriculture, industry, and commerce, and the respective observers; Japan, by the Imperial University of Tokei, Japan; Mexico, by Senor Mariano Barcena, director of the Central Meteorological Observatory in the city of Mexico; the Netherlands, by Prof. Buys Ballot, director of the Royal Meteorological Institute of The Netherlands at Utrecht; Norway, by Prof. H. Mohn, director of the Royal Norwegian Meteorological Institute at Christiania; Portugal, by J. C. de Brito Capello, director of the Meteorological Ob-

servatory of the Infante Don Luiz at Lisbon; Russia, by Prof. H. Wild, director of the Imperial Central Physical Observatory of Russia at St. Petersburg; Spain, by Antonio Aguilar, director of the Royal Observatory at Madrid, and of Don Cecilio Pujazon, captain royal navy, director of the Naval Observatory at San Fernando; Sweden, by Prof. R. Rubenson, director of the Royal Swedish Meteorological Institute at Stockholm, and of Dr. H. H. Hildebrandsson, chief of the meteorological division of the Upsala Observatory; Switzerland, by Prof. R. Wolf, director of the observatory at Zurich, and of Prof. E. Plantamour, director of the observatory at Geneva; Turkey, by A. Coumbary, effendi, director of the Central Observatory at Constantinople, and of Prof. C. V. A. Van Dyck, superintendent of the Lee Observatory at Beirut; Canada, by Prof. G. T. Kingston, director of the Magnetic Observatory at Toronto, and superintendent of the Meteorological Office of the Dominion of Canada; and by individual observers at other points.

A number of observations taken on vessels at sea to complement the synchronous reports of the service, and at the request of the department, have been received on the form provided for the purpose, paper 24. Their utility is evident in the study of storms approaching our coasts or which endanger vessels sailing from our ports.

The co-operation of the Navy of the United States in the taking of observations simultaneously with the system adopted at this office, wherever there are naval vessels of the United States, as assured by the general order of the Secretary of the Navy, dated December 25, 1876, has largely increased the data of this class. This co-operation has been skillfully rendered by the Navy Department, and the United States Navy, through Commodore Daniel Ammen, U. S. N., Chief of the Bureau of Navigation.

The people of the United States are thus the first nation whose Army and Navy co-operate, as all armies and navies should, under official orders, in the taking of simultaneous observations wherever the forces may be.

In view of the hoped-for extension of the system of simultaneous reports to be made at sea by the vessels of the naval and commercial marines of other nations, carefully tested barometers of the best make have been prepared, to be located as standards at the ports of New York and San Francisco. These instruments are for the purpose of affording opportunity for the comparison of the barometers carried on the vessels of any marine.

The offices of the Signal Service at the different cities and ports of the United States and upon the sea-coast offer every facility and aid in their power to the vessels of any nation.

With the plans for charting now testing at this office, and with the reports now received here, it appears that the meteoric changes occurring over a great portion of the continents north of the equator can be charted with an approximate accuracy sufficient to permit careful and valuable study. This charting, to be of the best attainable value, must be supplemented from the records of observations had on the seas. A ship at sea becomes one of the best of stations for a simultaneous system. The value of the record is enhanced by the change of the ship's location occurring within each period of twenty-four hours. There is no sea-going vessel but which carries human life, and each ought to carry by compulsion, if need be, meteorological instruments. The smallest craft, in caring for its own safety, may use them enough to add to the value of the most extensive record. There is no nation without interest in the work, proposed to be based upon exchanged simultaneous

reports, and none has hitherto hesitated when the subject has been properly presented to aid in a duty which, so easily done as to require very little effort on the part of any one person, has for its object a good to mankind. The work cannot, from its nature, be for the selfish good of any section.

A number of the great steamship companies, foreign and domestic, operating the principal commercial sea-routes, have promised and will give their powerful influence and aid.

The United States bear in the cases of all maritime observers co-operating in this system all expenses for forms, postages, &c., when so desired, and not infrequently, and when necessary, loan the required instruments.

The number of observations made daily on separate vessels at sea is seventy-nine. (Paper 15.)

Research has already gone far enough to indicate the paths by which, if it cannot be directly predicted, it can at least be studied to learn what sequences to follow conditions reported on or near the eastern coasts of Asia, or on the Pacific, will be found on our own western coasts.

Similar studies will have reference to our own southern and eastern coasts, and to the western coasts of the European continent.

The establishment of permanent ocean stations in lines traversing the oceans over or near the telegraphic cables, and in telegraphic communication with either continent, is not considered impracticable.

There has been no year which has given greater reason to hope that a progress has been made, which will eliminate from the study of practical international meteorology some of the greatest difficulties hitherto encountered.

There are grounds to hope also that the atmospheric conditions and changes of condition can be charted with sufficient accuracy over any extent of the earth's surface. If the hope has fruition, meteorological barriers will as against study practically cease to exist.

A copy of the international bulletin herewith (Paper 25) exhibits the character of the international reports, and that of the information had from each station. The chart accompanying this paper shows as nearly as is practicable the location of the stations, and foreshadows the duties the reports had from them will make practicable; the number of stations reporting increases.

While the stations are crowded in some localities, each is useful—each serving to check the work of the others, and each aiding to close the gaps the failure of other stations might sometimes cause. The work is not likely to be abandoned by those in the different countries who have taken part in establishing it, and who share its benefits. If it served no other purpose than to maintain the pleasant co-operation of those charged with the meteorological duties of the different countries, it would be of value. It is hoped that by systems of observations thus extensive, generalizations may be had to permit the announcement of approaching meteoric changes for periods longer in advance than have been hitherto practicable.

The average number of daily simultaneous observations now made in foreign countries is two hundred and ninety-three. The total number of stations from which reports are entered in the bulletin regularly is four hundred and sixty-three. The co-operation of the different nations secured by this plan of exchange as above described renders the additional cost to the United States of the grand system of reports it makes possible but little more than that of the cost of the preparation, paper, and binding of the International Bulletin, a cost which would have to

be met in great part for the proper preservation of the records themselves, even if the bulletin was not distributed.

In connection with these reports the time closely approaches in which, with the existing extension, they can be made very valuable for the studies of international meteorology. The specimen charts herewith (Map 2) of the observations of this class, charted for the fifteen consecutive days, commencing January 1, 1877, illustrate the graphic work the data collated on the International Bulletin already makes practicable. The suggestions charts of this nature offer as to meteoric changes, their succession and sequences, anywhere occurring, are valuable.

The total number of daily reports of all kinds now received and filed at the office of the Chief Signal-Officer is as follows: Number of daily service telegraphic reports, 474; number of international daily simultaneous reports, 317; number of reports from voluntary observers, 379; number of reports received from the Medical Corps of the Army, 119; number of reports received from United States naval observers, 62; making a total of 1,351 reports received regularly for discussion. (Papers 13 and 14.)

The daily official deductions or forecasts issuing from the office of the Chief Signal-Officer, and constituting the tri-daily "Synopses and Indications," as they are styled, and the especial deductions, in pursuance of which the orders for the display of cautionary signals at stations are given when necessary, are based upon the regular reports of the service-stations of observation, transmitted tri-daily to this office by telegraph, after passing over a system of telegraphic circuits, so arranged as to at once concentrate the reports at this office, and to distribute, in doing so, certain numbers of them at designated cities and stations. Especial reports are demanded from any station, or number of stations, whenever additional information is required as to impending disturbances. The Synopses are those of the meteoric conditions existing over and near the United States for each period of twenty-four hours, terminating at the hour for each general report. The Indications are announcements of the changes, considered from the study of the charts, in connection with such rules and generalizations as the experience of this office and the study of meteorologists seem to have determined to be indicated as to happen within the twenty-four hours then next ensuing. The study for each issue requires the draughting and examination of eight charts, these charts exhibiting chartographically the data furnished by the simultaneous reports of the stations heretofore referred to, and located in the United States, on the Atlantic and Pacific coasts of the Gulf of Mexico and of the lakes, and in the Western interior, and in the Dominion of Canada, Nova Scotia, New Foundland, New Brunswick, and the West India Islands. These charts are as follows: (*a*) A chart of barometric pressures reduced to the temperature of freezing and sea-level; of temperatures and of winds, together with the wind directions, and the velocities at the different stations; the amount, but not the nature, of the cloud formations at the different stations; the character of the precipitation, if any, occurring at the time of the report, and the amount of the precipitation, if any, since the time of the last preceding report. This chart exhibits barometric pressures and the temperatures noted at stations in their relations to districts of territory and to each other, by a system of isobaric and isothermal lines inscribed. The isobars are charted for inches and tenths of inches of barometric pressure; the isothermals for temperatures represented by the different multiples of 10°. The wind directions are shown by arrows at the different stations. (Map 4.) (*b*) A chart of the relative humidities appearing to exist

over territorial districts, with the temperatures at the different stations in relation to districts and to each other. This chart of humidities enables studies to be made in reference to territorial sections, the difficulties attending the study of observations of this character being obviated to a very considerable extent by the inter-correction of stations among themselves and by the great extent of the regions over which the readings are made simultaneously. In fields so great purely local conditions in part disappear, or affect very slightly the general result. This chart contains also the character and amount of the lower clouds, and the character, amount, and direction of motion of the upper clouds, when these are visible. On this chart are traced lines of equal relative humidity, and isothermals are also drawn, and described in chart *a*. (Map 5.) (*c*) A chart of the cloud-conditions prevailing over the United States, in which the character of the different varieties of clouds and their amount, as viewed from each station, are represented graphically by appropriate symbols. On this chart also appears the weather as reported at each station at the time of each report by symbols, the station at which rain has fallen since the preceding report, as well as the direction of movement of the upper and lower clouds, and on it each morning there are entered the minimum temperatures noted during the preceding night at the separate stations, at the local times synchronous with the hour of 11 p. m., Washington mean time, and lines of minimum temperatures are traced to exhibit these temperatures in relation to districts of territory. On this map are entered also the maximum velocities of the wind at particular stations when required to be specially reported in the intervals between the hours of regular report. The cloud-areas appearing on this map are surrounded by an outline charted to enable the extent and probable movement of these areas to be considered. There also appears on the copy of this chart, made at the hour of the midnight report, the appearance of the sunset at each station, as reported by the observer at that station, and as considered by him to indicate, when taken in connection with the appearance of the western sky at sunset, the character of the weather to be anticipated at that station for the twenty-four hours then next ensuing. (Map 6.) (*d*) A chart of variations of barometric pressures corrected for temperature and reduced to the hypothetical reading at sea-level. This chart exhibits the barometric pressures at the different stations, corrected for temperature and elevation. There are shown upon it the changes that have taken place in the pressures, so corrected, within the periods of eight and of twenty-four hours preceding the hours of reports at the different stations, and lines of "no variation" are traced to indicate the lines along which the barometric pressure has remained without change for these periods of eight and twenty-four hours, respectively. Lines are also charted, exhibiting those along which the barometric pressures have increased, with other lines exhibiting them, along which the barometric pressures have diminished during the same period of time, a separate line being drawn for each one-tenth of an inch of increase of barometric pressure, and a separate line being drawn for each one-tenth of an inch of diminution of barometric pressure. This chart displays, at a glance, the nature and extent of the barometric changes taking place over the districts covered by the maps of this office. Map 7. (*e*) A chart of actual barometric variations. This chart exhibits the observed readings of the barometer at different stations, corrected for instrumental error [variation from the standard at Washington] and for temperature the mercury reduced to the temperature of freezing, but not reduced to the hypothetical readings at sea-level. In this

office, observed readings so treated are known as the "actual readings." On this chart are traced lines of "no variation," showing the lines along which no change in actual pressure has occurred for the periods of eight and twenty-four hours, respctively, preceding the hours of report, and also lines showing the lines of rises or falls of the actual readings of the barometer for each one-tenth of an inch and for the same respective periods. This chart is valuable as exhibiting the nature and extent of actual barometric pressures, and the changes of such pressures, taking place at the different stations, and over the different territorial districts. Map 8. (*f*) A chart of dew-point variations. On this chart there are entered the values of the changes of the dew-point at the several stations for the periods of eight and twenty-four hours, preceding the hours of report; there are traced also lines along which there has been "no variation" in dew-point during such periods respectively, and lines showing the rises and falls for each five degrees in dew-point for the same periods. Map 9. (*g*) A chart of dew-points, vapor-tensions, and actual humidity. On this chart are entered the values of the dew-point at the different stations, and lines of equal dew-point are traced for each ten degrees' difference of the dew-point readings. At the extremities of these lines are noted the values of vapor-tensions and actual humidity, corresponding to the given dew-point lines. The examination of the charts *f* and *g* enables the hygrometric condition of the air and the changes in such conditions which have occurred within the periods of eight and twenty-four hours, respectively, to be considered in so far as these are indicated by the wet and dry bulb psychrometers at the different stations. Map 10. (*h*) A chart of normal pressures and variations from normal pressures for each eight hours. There have been computed during the past year, at this office, the mean of the observed pressures recorded at each station, at each of the hours at which observations are made at that station, for the regular simultaneous telegraphic reports for each monthly period. The series of observations used in computing these means has been for as many years as was possible at each station. These mean pressures are the mean pressures computed from the actual readings had at each station, at the habitual hour of observation, for each of the tri-daily full telegraphic reports required to be made from that station, and obtained, as explained above, by reducing the readings then made to a uniform temperature—freezing—and correcting for instrumental error (variation from the standard) only. Mean pressures so obtained are styled, in this office, "normal pressures" for the station, for its local hour of the report and for the month. On this chart is entered at each station, with the symbol + or —, the value by which the actual reading reported from that station at the hour of any report is above or below the "normal pressure" for that station for the hour of that telegraphic report and for that month. These deviations from such normal pressures may be styled "departures" from the normal pressure; the comparison of these "departures" for each period of eight hours shows what changes have taken place in the atmospheric pressure at the different stations, in each period of eight hours, after eliminating the horary variations of pressure. On the chart are traced lines of "no variation" in normal pressures, being the lines along which the pressures are at the time practically normal, and also lines of "departure" from the normal pressure for each one-tenth of an inch of mercury, by which the actual readings as reported are found to be above or below the computed normal. Such lines are traced for each period of eight and of twenty-four hours. This method of noting barometric pressures enables those taken and reported simultaneously from any number of

different stations to be considered for purposes of study in relation to each other without reference in each case to the local questions of altitude, horary variations of pressure, or other disturbing causes at the places at which they may be taken. (Map 11.)

The number of separate graphic chartings made and examined in the study-room, for the purposes of the daily studies of the office, during the year ending June 30, 1877, has been four thousand four hundred and seventy.

The charts prepared for the issues of the monthly review, and exhibiting each the data received for the month, and discussed for the month, have been three for each month, a total of thirty-six for the year.

The data thus accumulating on the files of this office have afforded scope for generalizations differing from and perhaps more extensive than any before had, in number, by any one nation.

The number of reports received daily and unceasingly have necessitated a constant labor to keep up, in the discussion of them, and in the record of the results of that discussion, to the dates at which the reports are recorded, in order to prevent an accumulation which, by its mass, might lessen their usefulness. The published daily study-charts of the office, and the monthly review, with its charts of generalizations, are examples of this work—the study-charts exhibiting a study of the data telegraphically received on each day; the monthly review combining the results had from these data and those received from other sources for each month during the year. It has been thus in the power of the office to lay before scientists and the public, at the close of each day, if necessary, and at the close of each month, and of each year, a summary for the periods then terminating. The labor of referring to the individual records in figures, which, after a time, becomes almost impracticable, is thus rendered unnecessary on the part of those who receive these papers. The charts of the average direction and velocity of movement of areas of low barometer; charts of the average barometric pressures at the hours of tri-daily report; charts of wind-direction found most frequent at the different stations before rain-fall; charts of rain-frequencies for the different months, are examples of other studies of generalization. Studies of this character, and incidental to those which have in view the pre-announcement of storms or other meteoric changes, furnish results valuable for practical uses.

Information of this character has been so freely and so widely furnished that it is not always considered that by no other nation is information of a similar character furnished to nearly a similar extent, and that seven years ago it had not been contemplated in the United States as possible to furnish it at all.

It is by studies of this kind, and in this great field of research, that the hoped-for rules, each of which is to add its aid in the effort to attain precision of forecast and foreknowledge of climatology for the United States, are to be elaborated. It is by such rules and such knowledge, slowly, but each year improving, the widest benefits of the service are to be sought. These will follow the practical use, by the people themselves, of the information gained through it, either in their attempts to have foreknowledge of coming changes from the study of their own instruments, or by supplementing that study by reference to the daily-published bulletins and reports of this office. There is hardly a class of the people, or an industry they practice, but to which good may, in this way, and from such studies, result. Enough has already been done to prove that it is possible.

The policy pursued by the office of diffusing as widely as possible, and

in condensed form, the information in its possession, and that of extending the scope of its observations, enables it to benefit, in studies like these, by the labors of students everywhere. The results returned to it in the able suggestions made by distinguished scholars who have received its publications, and based upon deductions had from the charts and data so furnished, aid in forming the rules on which its duties rest. The list of correspondents to whom the publications of the office are furnished contains the names of many of the leading scholars and scientific men in different parts of the world. The instances are not infrequent in which the most interesting papers upon the subject of meteorology, read before the most distinguished and learned societies in the United States, have rested for their value almost wholly upon studies of the data of observations and the charts prepared at, and furnished from, this office.

The search for generalizations or the support of theories becomes comparatively easy when the material is furnished in elaborated form, requiring little more than collation for either.

The Synopses and Indications have been furnished for the press at the regular hours, 1 o'clock a. m., 10.30 a. m., and 7.30 p. m., daily, and under the same rules as in preceding years. There has been no failure in the delivery of any report during the year. The total number of statements thus issued for publication has been one thousand and ninety-five. These have been telegraphed at the moment of their issue to the principal cities, and have appeared in some form in almost every journal in the United States. A careful analysis of these statements of the office, made for the year terminating June 30, 1877, and a comparison with the meteoric conditions afterward occurring within the twenty-four hours next ensuing, and within the district to which each forecast has had reference, has given an average of eighty-six and sixteen per cent. as verified.

The percentage of verifications for each district and for each month of the year is given in the following table. Reference is had to the district map:

Percentage of verifications of Indications for each month of the year ending June 30, 1877.

Districts.	1876.						1877.					
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.
New England	86.2	86.13	83.4	90.1	82.5	88.9	91.8	83.8	82.8	82.3	84.7	84.6
Middle States	87.4	86.83	87.1	90.1	82.0	90.2	89.0	82.0	83.1	84.8	87.0	91.4
South Atlantic States	84.3	88.23	80.1	92.5	83.7	90.4	85.4	85.6	88.6	86.1	85.4	83.1
Eastern Gulf States	88.2	87.68	84.4	88.6	82.2	89.0	84.8	82.2	89.4	86.4	88.8	89.2
Western Gulf States	90.3	88.91	83.8	87.1	83.4	87.8	85.5	82.9	85.8	88.0	88.3	90.1
Lower Lakes	87.8	88.60	85.1	88.5	82.9	89.3	90.5	84.6	83.2	85.8	86.4	86.6
Upper Lakes	83.9	90.20	81.5	91.9	86.6	88.1	88.1	89.3	80.1	86.1	82.5	82.0
Tennessee and Ohio Valley	83.2	86.52	85.5	91.9	84.4	90.0	88.0	82.1	83.3	88.1	87.9	86.1
Upper Mississippi Valley	88.7	86.99	79.8	91.7	86.7	85.1	89.0	84.9	85.6	84.9	83.7	85.0
Lower Missouri Valley	85.5	82.44	76.95	91.2	84.3	80.2	89.0	84.5	84.5	85.0	83.8	85.1
Total	86.4	87.25	82.8	90.4	83.9	88.1	88.2	84.2	84.6	85.7	85.9	86.5
Percentage of verifications for the year												86.16

These percentages of accuracy are for statements comprising the predictions of the barometric pressures, temperatures, wind-directions, and character of the weather to be expected in the districts to which they have reference, each of these elements requiring to be verified according to the plan herewith. (Papers 22½ and 22¾.) The percentage of accuracy

of forecast limited to the preannouncement of the character of the weather to be expected in the districts, exclusive of the other conditions above referred to, has been ninety and five-tenths per cent.

The popular faith in the announcements of the office, now in the seventh year of their issue, has increased. It has not at any time been sensibly lessened by the errors and omissions which sometimes direct attention to the fact that in the present condition of science, and with a system of observation still too limited, premonitions, having for their scope a territory so great as that of the United States, cannot always be correct for every part of a district.

The report of indications is necessarily limited also to a certain number and few telegraphic words, the report for a district comprising several States condensing into four or five lines.

It is not possible often to convey within this limit weather changes clearly indicated as to occur, but notice of which must be omitted for want of space. It would not be difficult to write for each State, and with benefit to the readers, a synopsis with the indications equal in the number of words to the number now allowed for those relating to all the States of the Union.

The popular knowledge of the duties of the office and its reasonable success is in no way better evidenced than by the criticisms to which the service is subjected if errors occur in its work. A few years ago the work itself was by many deemed impracticable. In recent criticisms, the same work has been commented upon adversely on occasions, and it has been stated that it ought never to fail, as the task of successfully forecasting had been proven so simple, that any person of fair education ought to be competent to perform it. There has been no work other than that of this office to cause this task to be popularly so considered.

Arrangements are in progress to extend the system of forecasts and premonitions of the office to the coasts of Oregon and California and the ports of those States bordering upon the Pacific and west of the Sierra Nevada.

The instruction of officers of the Signal Service to fit them for the various duties of the office has been continued. The especial duties in which the officers on duty are severally engaged, each in his sphere, and each of which duties contributes its share to the success of the whole, are such as necessarily prepare them for the courses of especial study and practice, and fit them to take charge, in turn, of the separate divisions and sections into which the office-work is divided. A roster for duty becomes in this way possible, and provides at once for the permanent continuance of a work to be prosecuted both by day and at night, by providing for the relief of men wearied in the discharge of such parts of the duty as impose severe physical as well as mental strain by others fresh from duties less burdensome, and insuring the instant filling of vacancies in the cases of the sickness or absence of any officer.

The studies to which reference has been hitherto made and the data condensed for generalization improve each year the material laid daily before the students in the office for consideration.

In the incessant work of the map-room and in making the computations constantly called for in the course of office-duty, important assistance is rendered by the competent and well-taught non-commissioned officers and soldiers on duty in the several divisions. In the matter of arriving at generalizations, it would be impossible often to handle the masses of data which must be considered without the faithful service of these men. While absolute accuracy cannot be expected in work so extensive as that required from this office, and the results of which are

demanded for instant publication, there is attained an accuracy sufficient for every practical purpose, and one which each year increases in rigor.

The data which appear in the publications of this office are checked figure by figure five times before the printing. They are, whenever it is practicable, accompanied by a chart, useful in itself, and by the charting, the best check upon all the data, which have served as its bases. Additional checks are adopted whenever experience has demonstrated a closer accuracy can be had.

In the work of the map room, and now in progress of preparation, is a colored orographic chart of the United States, on which the geographical elevation and slopes, as up to the time determined by hypsometric researches, are proposed to be exhibited in colored shadings.

It is the object of this map to permit geographic contours to be considered in connection with expected meteoric changes, and to provide incidentally for the study of atmospheric movements, as influenced in their rapidity, direction, and sequences by the forces of gravity, and the forms of the earth's surface in the locations in which they may be taking place.

A series of charts has been prepared exhibiting chartographically the position of the sun in altitude and azimuth and the relative power of the sun's rays for every change of two degrees in the declination of the sun, as estimated for points located at every five degrees of latitude and longitude throughout the United States.

The issue to which these charts have reference is that of the 7.35 a. m., Washington mean time. The charts exhibit also the hours at which the sun rises on each day at each point located as above described, stated in hours of the local time at that point. They show also by a charted line the line along which the sun appears just rising on the territory of the United States at the hour of 7.35 a. m., Washington mean time. These charts are intended for use in the study-room of the office, in connection with the study of the charting based upon the telegraphic reports, in order that the anticipated effect of the sun's rays may be considered in draughting the forecasts for each day.

The work of computation and the manual work on these charts have been performed by Corporal J. M. Wolbrecht. A specimen is herewith. (Map 3.)

The display of cautionary day and night signals, by flags by day and lights at night, has been made systematically, on occasions of supposed especial danger, at the following points, ports, and harbors located upon the Lakes, the Atlantic, and the Gulf coasts: Alpena, Atlantic City, Baltimore, Barnegat, Boston, Buffalo, Cape Hatteras, Cape Henry, Cape Lookout, Cape May, Charleston, Chicago, Cleveland, Detroit, Duluth, Eastport, Erie, Escanaba, Galveston, Grand Haven, Indianola, Jacksonville, Key West, Kittyhawk, Long Branch, Marquette, Milwaukee, Mobile, New Haven, New Orleans, Newport, New York, Norfolk, Oswego, Port Huron, Portland, Me., Rochester, Sandy Hook, Savannah, Smithville, Saint Mark's, Thatcher's Island, Wilmington, and Wood's Holl. Of these, Long Branch was discontinued July 8, 1876.

During the year ending June 30, 1877, one thousand seven hundred and seven signals have been ordered, counting each separate display at each port a separate signal, in anticipation of fifty-seven dangerous storms. Of the total number of signals thus displayed, seventy-eight and nine-tenths per cent. have been afterward reported as justified by the occurrence of winds held to warrant them at the points where the signals were displayed, or within the radius of 100 miles distance of

these points, as set forth in the rules of the office. In the cases reported as failures of justification following the display, the winds did not attain, within the described radius, a violence held to justify the warning. The signal ordered by this office is always cautionary in its character, not announcing that a storm will come, but that the indications are sufficiently threatening to call for caution, both as to going to sea and for preparation for rough weather if vessels are about to sail.

It is one of the most difficult tasks which falls to the office to determine in advance over what ports to be selected, to the exclusion of others, an advancing storm-area will pass, and in such a manner as to be accompanied at these ports with a given wind-velocity. Within the same area the winds differ in force at different points. They differ also with different contours of the earth's surface. There is the danger that warnings unnecessarily given may delay the movements of shipping. A heavy responsibility is incurred if the warnings are not given when they ought to be. Time, increasing experience, and increasing facilities will insure improvement.

The occurrence of a storm-area registering a wind-velocity of twenty-five miles per hour on land, indicating, as it frequently does, a wind-velocity of forty-five or fifty miles at a distance of ten or twenty miles from the land, is regarded as the lowest velocity justifying a signal.

There is no work of the office in which it has been felt necessary to progress with more caution than in that relating to the display of cautionary signals. None had ever been shown in the United States when the duty of making such displays devolved upon this office, and it was in debate whether any had ever been shown with practical success elsewhere. Experience has gone far enough in this country to demonstrate that the plans hitherto in use may be supplemented with advantage to commerce by an additional signal to announce that, although the area of storm-disturbance may not yet have passed the port or station, and though the wind-velocities may be high, the wind-direction will be northerly or westerly, or off the coast at the port at which such supplementary signal may be shown. It is contemplated to show as this complementary signal a white flag centered with a red square by day, flown above the red cautionary signal, and a white light shown above a red light at night.

The action of the office has been considerately criticised when, information having been received that dangerous cyclones were moving among or passing over the West India Islands, thus threatening our Atlantic coast, or had appeared in the Gulf of Mexico, or on the southern coasts of the United States, warning signals have been ordered up far in advance of the march of the hurricane at numerous ports, and directed to be kept flying until its course could be determined.

The weather has been fair at the ports often while the ocean reports brought afterward the record of a track of devastation far outside at sea. While many coasting voyages, which might have been made in safety by frail crafts, may under such circumstances have been hindered at these times, it was possible that any one of them then undertaken might lead to the destruction of a crowded vessel.

The danger-signal of the service always invites inquiry to be made at the office at which it is flying as to the location of the signaled danger. In the cases as cited notice of the location and character of the storm-area is also communicated, as quickly as is practicable, to the press. It is not yet seen what further provision can be made. Four dangerous cyclones, each occupying some days in its march, have this summer

threatened our Gulf and Atlantic coasts. No craft ought to sail at such times from any coast port without full knowledge of the possible danger.

An organized plan for subordinate stations at which cautionary signals may be displayed (systems of these stations being managed as subordinate to and in connection with the signal stations of the first class, established at the principal cities and ports of the United States, and immediately controlled from this office) has been put in operation and tested within the period elapsing since the date of the last annual report. These minor stations are located at the lesser harbors or inlets on coasts contiguous to the larger stations of the first class, and are designated "display stations."

If the plan adopted stands the test of a prolonged trial, it will be possible, with an appropriation not exceeding in amount that estimated as necessary for the fiscal year commencing July 1, 1878, to extend the display of cautionary signals now limited to that at the principal cities and ports, to all recognized ports on the lakes, Gulf coasts and sea-coasts of the United States.

A completeness of work, which a few years ago seemed not to be attainable on the part of the office for many years, has by the experience gained in these duties become almost within its reach.

Attempts have been made to determine definitely and to the satisfaction of the office, by the compilation of statistics, what certain benefits to shipping have followed the displays of cautionary signals. The reports of the observers at stations give instances in which numerous vessels have remained in different ports in recognition of the warnings given. In these cases danger was avoided. In other cases the displays of signals on dangerous coasts have been followed by the making to sea for an offing of all of the vessels in sight of the display. In other instances reported, vessels going to sea in disregard of the warnings have been driven back, have suffered injury, or have been lost. So far as can be judged at this office, a proper attention is paid to its warnings, particularly on the part of the coasting or smaller classes of vessels on the sea-coast, and by shipping generally on the lakes. Especially does this happen at those times of the year recognized by seamen as the stormy seasons. A series of tables of disasters to shipping, compiled for a number of years, have seemed to show that the annual average of disasters occurring at or near points at which cautionary signals have been displayed has been lessened by a considerable percentage for the years during which the displays have been had. The discrimination made by insurance companies against sea and lake ports and places which have no signal station, amounting in the aggregate to a very considerable sum, is an evidence of considerate appreciation.

During the year ending June 30, 1877, four hundred and twenty storm-warnings for Canadian stations were telegraphed from this office to Prof. G. T. Kingston, chief of the Dominion meteorological office at Toronto, Canada.

The plan of exhibiting as widely as possible, in the agricultural districts throughout the United States, the results of the daily office studies in the form of printed forecasts for the benefit of the agricultural populations has been continued in operation. The effort to cover so wide an extent of territory has made the labor great. The continuance of the work has seemed to be warranted by the favor with which it has been received. It has been considered due to the farming populations that they should have an opportunity to profit by whatever information could be given them. With the active co-operation of the Post-Office Department, with which there is an arrangement for this purpose, six thousand

two hundred and sixty-four printed farmers' bulletins, on which have appeared daily the reports of this office, have been distributed and displayed in frames daily at as many different post-offices in different cities, villages, and hamlets in different States. There are numerous and especial requests to increase this number. At 1 o'clock a. m. of each day the midnight report of the office for the ensuing day has been telegraphed during the year ending June 30, 1877, to seventeen centers of distribution, located in the following-named cities: Albany, N. Y., 268; Bangor, Me., 163; Boston, Mass., 659; Buffalo, N. Y., 310; Burlington, Iowa, 150; Chicago, Ill., 557; Cincinnati, Ohio, 557; Detroit, Mich., 335; Leavenworth, Kans., 176; Logansport, Ind., 191; Memphis, Tenn., 46; Nashville, Tenn., 98; New York, N. Y., 704; Pittsburgh, Pa., 312; Philadelphia, Pa., 817; Saint Louis, Mo., 380; Washington, D. C., 454. At seven of these stations of distribution the bulletins are printed by civilian employés upon the office press, and under the immediate supervision of the sergeants in charge. At ten stations the work is done wholly by the enlisted men of the Signal Service.

The numbers placed after the names of the cities denote the number of hamlets, post-offices, or railway-stations supplied from each.

These centers have been carefully chosen as in the midst of the denser agricultural populations of the United States, and at points whence the facilities of communication would enable the surrounding districts to be most rapidly supplied.

Arrangements are in progress to establish a station of distribution at Sacramento, Cal., for the farmers of the Sacramento and San Joaquin Valleys.

The telegraphic report of forecast telegraphed from the central office at 1 a. m. of each day, and received at a center of distribution, is at once there printed on bulletin forms provided for that purpose. These are enveloped as rapidly as printed, addressed to each designated post-office within the district to be supplied, and which can be reached by the swiftest conveyance by the hour of 2 p. m. of the date, and are then placed in charge of the Post-Office Department under an arrangement by which each postmaster receiving a bulletin has the order of the Postmaster-General to display it instantly in a frame furnished by this office for that purpose, and to report, in writing, the fact and time of its receipt and of its display to the Chief Signal-Officer.

The bulletins have reached the different offices, and have been displayed in each of the frames at the average hour of 11 a. m., averaging thus ten hours from the time the report has left the office of the Chief Signal-Officer until it has appeared bulletined in the midst of the farming populations, and accessible to them in the distant parts of the country.

The information given on these bulletins has a value in addition to the forecasts. Facts relating to the climatology of the different sections are condensed into brief notes, which are published with the telegraphed reports. For instance, each bulletin now announces for the geographical districts in which it is displayed, and, in addition to the forecast for the day, what winds in each month have been found most likely and what least likely to be followed by rain at the stations within each district. This simple foot-note has its effect in increasing the gains and reducing the losses of harvesting. These bulletins will improve for the uses for which they are intended as the experience of the office permits the information they exhibit to be supplemented with further data and other rules. With each year the popular knowledge of the uses of the bulletin and some increased interest in and study of meteorology ren-

ders the farming communities better able to judge of its correctness and to benefit by its contents. It is contemplated, as the work of the office progresses, to add to the bulletin such brief instructions as may be developed in regard to its uses in connection with such local instruments as may be had for local use. Reference has been made in preceding reports to the economy of this work. Careful estimates have shown that if the total cost for each bulletin station at which the bulletin is displayed at each different post-office, hamlet, village, or city were computed to be twenty-eight cents per day, the sum so resulting would meet all expenses caused by Signal-Service. A little saving of any one crop or gain to any interest made on any one day in the vicinity of each station, supposing nothing to be saved on any other day of the year at or near that station, would more than counterbalance this expenditure.

A simple form of instruments combined for farmers' use, to be used by farmers themselves in connection with these daily bulletins, and showing when adjusted, (1) whether the barometer rises or falls, (2) the character of the sunset of the preceding day, (3) whether the wind is in the rain or dry direction, (4) the temperature and increasing or diminishing humidity, has been prepared for issue, and will, with brief rules for use, be published for distribution.

The river-reports, giving the average depths of water in the different great rivers of the interior, and notices of dangerous rises for the benefit of the river-commerce and the populations in the river-valleys, have been regularly made, telegraphed, bulletined in frames, and also published by the press at the different river ports and cities.

A circular issued from this office on March 15, 1875, and showing the range between high and low water marks on the Western rivers, and the heights at which the river-rises become dangerous along their banks, is believed to have been the first systematic attempt to establish a "danger line" on those rivers. A "danger line" is that imaginary line which passes through points at measured and announced heights above the low-water mark at the different cities and landings, and above which line if the water rises there is danger of injury to property or plantations. This circular was prepared from data collected at this office, and was given, by order of the Secretary of War, a wide circulation through the press and otherwise. The uses of the information thus published have been shown upon the occurrence of the river-floods; a reference then had to the circular, in connection with the daily reports, enabling those interested to judge of the probable limits of the rises of the water to be expected at the different places upon the river-banks, and of the dangers to be anticipated. This knowledge has made possible many and necessary precautions for safety.

Steps have been taken to extend the plan of river-reports of this year to the rivers of California and Oregon, the rapid rises and falls of which involve sometimes large grazing interests, as well as those of agriculture and commerce.

The data had at this office from stations making river-reports, though scanty as compared with those to be desired, permit a foreknowledge of changes likely to happen, and enable useful warnings to be given of coming floods, ice-floods, or of sudden and great rises of the river-water levels. The daily reports are useful also at times of low water, the information they then give permitting river-shipping to be moved with intelligent foreknowledge of the probable depths of water to be found in the river-channels at different points upon the river's course. These

reports are especially useful to those for whom they are intended, as having an official character.

The manner in which the river-reports continue to be received by the communities especially concerned, and the official requests of boards of trade and others engaged in river-commerce for the increase of the number of such reports, have given evidence of their usefulness.

In instances attracting attention, the notices of the probable heights floods anticipated or passing would attain, have been followed by preparations made upon the levees to guard against danger. A brief examination of the charts of changes of the river-levels accompanying this and preceding reports, shows that the river-rises to occur at the different localities can be judged of frequently as to the time at which they will occur, and their extent by the conditions existing at points sometimes far distant. Accumulating data render studies of this kind valuable.

In connection with these studies the examination of the daily weather-charts, exhibiting places at which precipitation has occurred, or is likely to occur, and the amount of such precipitation, had with the study of the charts of the river-basins, which enable it to be determined what rivers will be affected by precipitation, are found to be of value in furnishing correct prognostications. This subject has been referred to in preceding reports.

The Chief Signal-Officer is confirmed in the opinion before expressed, that, with a proper study of the river-floods, and with stations properly placed, reporting at times of especial danger, it can be made almost impossible for a flood to follow a river-course without notice given in advance of its coming at the localities threatened. Daily bulletins of river-reports have been regularly displayed during the year at the following-named stations: Cairo, Ill.; Cincinnati, Ohio; Davenport, Iowa; Dubuque, Iowa; Keokuk, Iowa; La Crosse, Wis.; Leavenworth, Kans.; Louisville, Ky.; Memphis, Tenn.; Nashville, Tenn.; New Orleans, La.; New York, N. Y.; Omaha, Nebr.; Pittsburgh, Pa.; Savannah, Ga.; Shreveport, La.; Saint Louis, Mo.; Saint Paul, Minn.; Vicksburg, Miss.; and Yankton, Dak. Systematic reports of river-observations, carefully made and closely studied, are had daily by telegraph and weekly by mail, on established forms, from the stations above named. Reports of similar daily observations are also had from twenty-four special river-stations named in the record of stations. For certain months of the year in which danger is not anticipated from floods, these reports are forwarded by mail. For the months in which floods more frequently happen, and at any time in any case of especial danger, the reports are telegraphed. The observers are, in effect, a river-guard.

Charts of the changes in the principal western rivers, for the year ending June 30, 1877, and upon which stations reporting to this office have been established, are given in Maps 12 to 20.

It will be noted that by the study of such charts, continued from year to year, those seasons in which floods are more likely to occur on any water-course can be predetermined, and it can be ascertained what amounts of precipitation, occurring in the different river-basins, and under what circumstances, will be followed by floods, and approximately what will be the extent of floods shown in this way to be anticipated. Whenever the facilities of the Signal Service are so far extended as to permit systematic observations to be had of any river-course and telegraphic warnings to be given in instances of danger, the serious losses of property or life caused by floods can be, and with comparatively little expense, guarded against on any river throughout the United States.

The occasions occur on the separate streams at long intervals only. The levee systems of the Mississippi and other great rivers can be in no way better guarded themselves, and made in their turn safeguards to the immense agricultural interests they are intended to protect, than by systems of river report, which will warn of danger in time, and summon, if need be, the strength of the State to watch and strengthen these State constructions.

The daily reports of the surface and bottom water-temperatures at designated points upon the rivers, lakes, and sea-coasts have been continued during the year. These reports are furnished at the request of Prof. Spencer F. Baird, United States Commissioner of Fish and Fisheries, the object had in view being to determine the proper rivers and lakes in which to place the different varieties of food-fishes. It is necessary, for this purpose, to ascertain the extremes and means for the year of the water-temperatures in the different localities. This series of reports has now continued for five years. Statistics of this kind, the depth of the water in the different streams being as it is daily noted, form the basis of a systematic study of pisciculture, in which are considered, by students attached to the commission, both the amount of the water supplies in the different channels or basins at the different seasons of the year and the temperatures to be expected in each. There is no more ready way for furnishing cheap food for the people than by the culture of food-fishes, and every facility for the work within the control of this office is gladly furnished to this end. It is quite possible that the great sea-fisheries on or near the Atlantic coasts or on the fishing-banks could be materially aided by the preannouncement of barometric or other atmospheric changes approaching, were the office informed of the precise nature of the reports to be desired.

The series of reports, being the announcements from day to day of such approaching changes of temperature as would be likely to cause the closing of the canals by freezing, or, as in other cases, would open them, were continued during the days of closing canal navigation of the fall and winter of the past year. The commerce moving upon the canals, as their closing draws near, is sometimes of greater value than at any other portion of the season. These water-routes are then thronged with hundreds of laden barges, each of which must move with reference to the danger of the closing of the routes by freezing. The market rates at the great cities are influenced by the probability that the merchandise or grain thus afloat will reach or fail to reach the points for which it is intended. These reports are received with satisfaction by the canal commerce, and by the commercial associations of cities. They constitute, for the months of November, December, and January, one of the regular issues of the office.

By a provision of the act making appropriations for sundry civil expenses of the government for the year ending June 30, 1878, the Secretary of the Interior was authorized to appoint a commission of skilled entomologists to report upon the ravages caused by swarms of the Rocky Mountain locusts in the Western States and Territories, and the best practicable method of preventing their recurrence, or of guarding against them. The commission, so appointed, requested the co-operation of the Chief Signal-Officer of the Army, in furnishing information in regard to the temperature and humidity of the atmosphere, prevailing winds, and other usual phenomena for sections of territory which had before been ravaged or which were supposed to be menaced by locust swarms. In compliance with this request, the observers of the Signal Service, at stations located within the territory which suffers most from the ravages of the

locusts, were instructed to obtain and forward to this office all information attainable relative to the appearance and movements of such swarms, and the atmospheric or other conditions which notably influence their strength, or the direction, rapidity, and extent of their march.

Should the Secretary of War so direct, and appropriation permit, it is considered that it would be practicable to preannounce, in districts menaced, the coming swarms in time to permit precautionary measures, such as the housing or protection of green crops. (Papers 38 and 39.)

The exhibition of symbol maps, on which the meteoric conditions are shown by symbols, changing for each report, at the rooms of the boards of trade, chambers of commerce, and of commercial associations in the principal cities, and at places of public resort, for the benefit of shipping and other interests, the display of bulletins, the distribution of weather-maps, and the employment of other methods for rapidly diffusing for public use the information had at this office, have been continued for the year ending June 30, 1877. The purpose had in view by this regular distribution has been to induce an effort on the part of those examining the different charts and papers to foretell to some extent the changing weather for themselves. The official reports of the office relate to districts, at special localities in which districts the local indications may point to modified conditions. These local studies are useful also in many ways which space would fail here to describe. The expectation of the office has been well realized in this regard, and in many places there are among the citizens and business men careful students of the data daily symbolized, who use their own judgment to determine to what extent the conditions announced for the district will prevail at the places in which they may be, or consider approaching changes foreshadowed by the symbols upon the charts, but which are yet too remote to be officially announced as indicated. Investigations of this character ought to be encouraged.

The form of the bulletins published for the uses of farmers, of those issued for the uses of seamen, for the river reports, for the canal reports, and for the other varied interests which the information borne upon them is intended to benefit, change gradually with increasing knowledge and facilities. Each form has, however, its object. The issue of bulletins is closely scrutinized for every station, and the number is reduced to the smallest number which can be wisely used.

The publication of the Monthly Weather Review and of the Weekly Weather Chronicle has been continued during the year. The monthly issues of the Review are given in the appendix. (Papers 26 to 37.) Nineteen volumes of the bound Daily Bulletins, with accompanying charts, had been issued up to June 30th, 1877, and other volumes will follow as rapidly as they can be obtained from the printer.

The scope of the Monthly Review has become extensive with the increase of the number of reports received, both by telegraph and by mail, all of which are valuable for reference, and a study of which enters necessarily into the study for the preparation of each Review.

The collection of materials for this paper permits also the study of especial storms, descriptions of or facts relating to which are given in the local journals of the region over which they pass, or in the shipping-news communicated by vessels encountering them at sea. The three charts which accompany each issue of the Review exhibit the uses made of meteorological data. Each of these charts is, to some extent, the reduction of data first chronicled on two hundred and ten separate study-charts for the month. It will be readily understood how much this

monthly reduction simplifies the work of generalization for the year. The Review exemplifies also, to some extent, the consideration of the great mass of data before mentioned as entering upon the files of this office. Each issue of the Review now contains, under the head of "Notes and Extracts," a brief summary of current meteorological intelligence, compiled from the publications received at this office, and by which the marked advances in meteorological science are readily brought to the notice of the numerous correspondents co-operating with the service. The wide circulation given this publication meets, in part, the popular wish for generalizations prepared by this office, while the receipt of a copy of the Review by each one of the hundreds of the voluntary observers, now its correspondents, is accepted by them as at once a sufficient acknowledgment of, and compensation for, the labor of making their daily reports.

The preparation of the matter for the publication of the "Synopses, Indications, and Facts," commenced in 1872 as the "Synopses, Probabilities, and Facts," has been continued.

These volumes, issued in sequence, one for each month, contain the records of all the tri-daily telegraphic reports received at the office from the dates at which such records commenced; the tri-daily charts, based upon the study of which each report was on that date issued, with a statement of the "facts" or meteoric conditions which subsequent reports have shown as actually existing during the time and in the district for which each forcast was made. It is readily noticed by scientific men that the maps in these volumes, at once condensing and checking the bulletins printed therein, afford a meteorological record as compact as ought to be desired for especial researches, or for generalizations to be based upon continued series of meteorological observations. The volumes themselves are useful for purposes of exchange, and bring to the office publications, sent in return exchange, fully equaling their value. They constitute a meteoric record more full, perhaps, than any other now issued.

It was estimated in the last annual report that by the publications of this office, which have been above referred to—by the cautionary signals displayed by day or at night on coasts or at ports in times of probable danger; by the announcement of probable changes of weather in the synopses and indications furnished thrice daily to the press; the farmers' bulletins exhibited at so many villages and hamlets in the interior; the river and canal reports made with reference to river and canal interests; the bulletins and data exhibited at all the great cities and ports; the symbol-maps displayed in boards of trade rooms and rooms of chambers of commerce; the Weekly Chronicle and Monthly Weather Review furnished to agricultural societies, commercial associations, and correspondents of the office; the daily weather-maps; the monthly charts, and, finally, the charts condensing the results of years of observation—the information emanating from this office was received in some form daily at not less than one-third of all the households of the United States. It must be considered, in estimating such a distribution, that the distribution is easiest and the readiest modes of communication are found in those districts which, most densely populated, contain the greatest number of households.

As hitherto related in this report, while treating of the subject of international meteorology, the work of the office reaches later, and by its publications, nearly every prominent establishment in the world. The statement is made in no spirit of boastfulness, but as simply advancing the claim that the office contributes, and steadily, to the world's work

material valuable now—to be more so in the future, and sufficient to compensate the whole cost of this especial service from its commencement.

The different reports of the office, of which mention has thus been made, have been favorably received in the communities for which they have been furnished, and their uses have been acknowledged by communications from commercial associations and by other official action.

The regular daily publication of the reports of forecasts by the press, now continued for seven years without cost to the United States, is considered as an evidence of their usefulness and of the favor with which they are received by the communities for which they are intended.

The office is in correspondence, in reference to its duties, with committees appointed for the purpose by the boards of trade and chambers of commerce of the principal cities in the Union, and also with a large number of agricultural societies. (Paper 11.)

A number of sets of resolutions officially adopted by the leading associations of this character in the prominent cities of the United States, expressing approval of the service, and asking favorable action in its behalf, accompanied the last annual report. These resolutions were officially submitted to Congress at its last session.

Permanent committees have been this year appointed by the action of the boards. These committees inspect the local offices at the places in which they may be and report monthly to this office upon the condition and utility of the service in their vicinities. The boards in this way at once co-operate with this office and share the responsibility for its success.

A resolution as follows has been adopted by a number of the prominent associations in the United States:

"*Resolved*, That the meteorological committee of the board of trade (or chamber of commerce) shall be a permanent committee, and that the names of the members, and any changes in membership, be, in each case, formally notified to the Chief Signal-Officer of the Army. The committee will confer with the Chief Signal-Officer and will bring before the board (or chamber) all matters requiring its action, as relating to, or needed for, the improvement of the Signal Service."

The organizations which have adopted this resolution are enumerated in paper 12. Rules for the government of these committees have been prepared, together with the desired form of monthly reports.

The appointment of these committees furnishes at once a board of reference, to which questions of local interest may be referred for their views, and provides an authorized source from which this office may learn of its successes or failures, and be thus enabled to direct its efforts in the several localities. It furnishes also a local supervision by parties interested themselves through their personal interests in the successful discharge of the duties of the service, and who will strive, for this reason, to best advise how that success may be attained.

Sergeant Henry Calver furnished a report upon the Mount Carmel (Ill.) tornado of June 4, 1877 (paper 41).

A list of disasters upon the lakes for the year ending June 30, 1877, compiled by Sergeant S. W. Rhode, Signal Service, U. S. A., in charge of the Milwaukee station, is given in paper 42.

Sergeant A. C. Ford furnishes a report of a balloon ascension made from Nashville, June 18, 1877 (paper 43).

Private L. M. Turner furnishes a paper upon the meteorology of Saint Michael's, Alaska (paper 45).

Paper 10 contains the names of places from which requests have

been received for the establishment of signal stations, but at which stations had not been established June 30, 1877.

In the instrument-room of the office eight hundred and twenty-eight meteorological instruments have been carefully compared with the official standards during the year, and eleven hundred and sixty-four have been issued during the same period. Experiments with different forms of self-registering apparatus have been continued systematically with the view of securing forms adapted to general uses on stations. Attention has been especially directed to perfecting instruments to record, by electricity, at a distance; for instance, a barometer-tube being located at the city of New York, to be so fitted with apparatus and electric wires attached that the rises and falls of the mercury in the tube at New York may be automatically registered on paper in Washington.

There have been tested apparatus for similar ends, with a view of causing other instruments to register similarly and at a distance automatically their readings. The successful application of such apparatus is to be desired.

In compliance with instructions received from the Secretary of War, under date of March 25, 1875, First Lieut. F. C. Grugan, Second Cavalry, acting signal-officer on duty at this office, was, on November 20, 1875, assigned to the duty of collecting, arranging, and displaying at the International Exhibition of 1876, subject to the direction of the chairman of the board on behalf of the United States Executive Departments, such stores, materials, and articles pertaining to the Signal Service as might be designated by the Chief Signal-Officer to be placed on exhibition.

This duty was performed at this office until March 20, 1876, on which date Lieutenant Grugan proceeded to Philadelphia, where he remained until the close of the exposition, November 10, 1876.

In addition to the display of such experimental self-registering instruments as have been adopted for the use of the Signal Service after careful examination, the ordinary station instruments and a full set of office publications have been exhibited, together with a station in practical operation, illustrating the printing of maps and farmers' bulletins, the issuing and posting report bulletins, receiving and transmitting reports by telegraph, and such other duties as are usual at a station of observation. In military signaling the display has consisted in the regulation equipments and supplies for day and night signals, the heliograph, a field-telegraph train fully equipped, and a field-telegraph line in operation. Graphic meteorological charts charted at this office, and transmitted in the lines of the charting by telegraph to Philadelphia, were used for the first time of which there is known record at this exhibition. These charts formed the bases of daily weather-maps there issued. A smaller map, based upon the same work, appeared in a newspaper—the New York Herald—printed on the grounds.

The Chief Signal-Officer has to acknowledge the receipt, through the Secretary of War, of three awards for the Signal-Service display in the government department at the International Exhibition at Philadelphia. One of these awards was for "Meteorological Maps," one for "Reports, Maps, and Apparatus," and one for "Collective Exhibit." Reference was made to this display in the last annual report. Extracts from the report of First Lieut. F. C. Grugan, acting signal-officer, are herewith (paper 40).

The regular weather reports have been received during the year over the wires of the Western Union, Northwestern, and International Ocean Telegraph Companies. Seven hundred and eighty-six thousand seven hundred and seventy-five cipher-words of weather reports have been

received at, and one hundred and sixty-two thousand six hundred and thirty-three sent from this office during the year ending June 30, 1877. Nine thousand two hundred and ten telegraphic messages, other than weather reports, were received, and eight thousand seven hundred and twenty-four sent, in the same period. There were also received twenty-one thousand eight hundred and eighty-eight cipher-words of special river reports.

The plans of working forms of telegraphic circuits, and the rapidity of telegraphic work by them assured to the service, have been sufficiently referred to in preceding reports.

The average time elapsing from the time at which the readings of the instruments have been had at the stations scattered throughout the United States, to that at which the reports based on these readings have been telegraphed to the press and to the distributing-stations, has been one hour and forty minutes.

It is considered with some satisfaction, as one of the consequences resulting from the organization of this office, that, by the use of its ciphers, improved with the experience of years, the facility with which constant practice has rendered practicable the telegraphic work necessary for its reports, and the understandings arrived at with telegraphic companies, the annual cost of the telegraphic communications of the office has been reduced by many thousands of dollars. In work of the character of that performed by this service, this annual saving must be considered as an actual saving to the Treasury of the United States of an equal number of thousands of dollars. In the early days of the duty the telegraphic companies overestimated the labor required for the service, and the difficulties to be encountered by them in discharging it with the regularity and the rigor demanded. With the long experience of years the difficulties of this nature have vanished.

The relations of the office with the telegraphic companies are becoming cordial everywhere. It has come to be recognized that when the office insists upon work at very economical rates, and as the companies sometimes consider a large amount of it, it is compelled to do so by the plainest dictates of duty.

A new edition of the Telegraph Cipher has been prepared, in which provision is made for reporting observed barometric readings, not corrected for elevation, in addition to the usual readings, reduced to the hypothetical reading of sea-level. This single item has required the addition of sixteen hundred cipher-words. To obtain this number it was necessary to revise the whole cipher manual, which now contains five thousand one hundred and thirty-six cipher-words.

The sea-coast service of the Signal Service, in connection with the life-saving service, has been before referred to in this report. The total length of the sea-coast lines constructed by this office is five hundred and forty-three miles. The coast-lines are connected with the office by leased wires from Cape May and Norfolk. The telegraphic lines, reaching from Sandy Hook to Cape May, and from Norfolk to Cape Hatteras, and from Wilmington to the mouth of Cape Fear River, on the most frequented and in some places the most dangerous coasts of the United States, have been continued in operation. The stations upon these lines are occupied, and the telegraphic lines are operated by enlisted men of the Signal Service.

The act of Congress requiring this service contemplates the establishment of signal-stations at life-saving stations and light-houses at points along the coast in such manner that the coast and sea in their vicinity may be at once kept under observation, warning of approaching storms

be given to vessels within signal distance, and information of disasters and other incidents occurring be rapidly conveyed to the chain of life-saving stations, to light-houses, ports from which aid may come in case of need, and to this office.

These lines and stations are on the sea-coast itself, and in positions whence they command a view of the sea, and where they can have knowledge of disasters to occur from shipwreck. The reports of the weather conditions and of the state of the sea had by them, and not attainable in any other way, are necessary. Vessels passing in view can be at once warned by signals of coming danger, or be communicated with by signals, and can be aided if in distress. The telegraphic wires connect each station directly with the War Department.

It is an advantage of the telegraph lines thus managed and worked, that the breaking of the wires at inlets or in violent gales need not break the communication. In cases during the year just past, messages have been transmitted for weeks together over extensive breaks of wire-lines reaching past inlets, by day and night signals with flags and torches.

The enlisted men at these stations have been taught to take and report meteorological observations, and, as signal men, are practiced in both the Army and Navy codes, in the use of semaphores, and in that code of permanent flag-signals known as the International Code, to enable them to communicate with vessels of any nationality. The service has proven its usefulness in the case of a number of disasters to shipping. Its uses for meteorological purposes are before referred to. In the cases of savings at the times of disasters, it is believed that the values saved have been greater than the whole cost of the lines.

The sea-coast service stations in operation at different dates have been at Sandy Hook, Long Branch, Squan Beach, Barnegat, Atlantic City, Peck's Beach, and Cape May, New Jersey; Norfolk and Cape Henry, Virginia; Kittyhawk, Cape Hatteras, Cape Lookout, Portsmouth, New River, Wilmington, and Smithville, North Carolina. Of these, Sandy Hook, Barnegat, Atlantic City, Cape May, Norfolk, and Cape Henry have been in continuous operation.

The constant changes occurring in the widths of the numerous inlets, across which the line upon the coast is carried by cables between Cape Hatteras and Wilmington, the destruction of portions of the lines and changes in the coast itself, caused by storms, have frequently interrupted communication south of Cape Henry. The force and the appropriations available have not permitted extensive repairs up to June 30, 1877. It is hoped the appropriations for the ensuing year will permit portions of the line to be re-erected, and the line itself maintained in good condition.

The Chief Signal-Officer does not feel called upon to refer at length to the importance of a service of this character on the sea-coasts. The reasons for its maintenance and the benefits to be expected from it are manifest. The commerce which approaches a coast on which such a service exists, properly conducted, is spared disasters, in comparison with the cost of which the cost of the service is little.

The watch kept by the service, and the prompt transmission of a few messages, have, in time of danger, saved property amounting to more than the cost of the lines.

Instances occurring since the date of last report have called into operation every duty for which these lines and stations were planned, and are cited as proving the propriety of establishing them and illustrating the manner in which they compensate for the necessary cost.

In the incidents of the year have been communication by signals with vessels of war of foreign nations and of the United States, with commercial vessels, and the report by telegraph of the numbers of, either so far as visible from or known at, any sea-coast station.

On March 21, a storm of unusual severity was signaled from the central office, as threatening the middle Atlantic coast of the United States. On the morning of the 22d, when the fog had lifted, Sergeant Stein, of the Signal Service, then in charge of the station at Cape Henry, discovered a large vessel stranded on a dangerous shoal off that station; he at once notified the wreckers of Norfolk, and reported the fact to this office. Nothing was known at that time of the nationality of the vessel, the port from which she had sailed, her cargo or condition. The life-boat from the life-saving station was driven back while attempting to reach her. With the earliest light the sergeant displayed at his station the attention-flags of the International Code—a code which ought to be legible by the marine of every nation, and with which every sea-coast station of the Signal Service is supplied. The answering signals soon flew from the stranded ship, and it was telegraphed by flags of the International Code that the vessel was the English ship Winchester, which had sailed from Liverpool in ballast, bound for Norfolk, McDonald, master, with a crew of twenty-seven men. The captain further desired that two steam-tugs should be telegraphed for at the nearest port to come to his assistance.

This message was at once sent to Norfolk by electric telegraph by the men of the Signal Service, who were keeping up at the same time communication by code-flags with the endangered vessel. The official signature of the sergeant in charge of the station was a sufficient authority to the wrecking steamers telegraphed for to start to the rescue. By the same electric wires the facts were at the same time telegraphed to the central office at Washington, whence, being communicated to the life-saving and other departments, the whole force of the United States could, if needed, have been brought into action. The work went on at Cape Henry, the vessel asking by signal that a safety-line might be fired to them, and the life-saving service making the attempt. The range was, however, too great. Later in the day, a line was floated ashore from the ship, a life-car put in operation and a number of the crew landed. The crew were reported all safe. Before sundown, as the storm diminished, active efforts to save the ship had commenced. A part of the crew remaining on board, a plan of night-signals was arranged, which, shown from the vessel, should call for the launching of the life-boat to bring them off in case of need in the night.

The next morning, March 23, the captain of the vessel came on shore, the life-car being still kept working to the vessel. The men of the crew were sent back to aid the wrecking parties as soon as the sea should permit the steamers to approach the vessel. The work commenced on March 23, and was continued on March 24. On March 24, the cautionary signal was again ordered up at the station, another storm-area then approaching from the Southern Atlantic coast, and especial warnings were sent to the ship and those employed on her to take such precautions as would enable them to land in case of danger. On the evening of March 25 a violent storm, with very heavy sea-swell, had reached Cape Henry. On the morning of March 26 it still continued, and with the light the sergeant in charge of the station discovered three barks stranded near the Winchester, all within a mile of each other. The storm continued violent. The wreckers at Norfolk were at once telegraphed the new disaster, and the facts related to the Chief Signal Office

at Washington. The "attention signal" was again flown for the bark which seemed most in danger. No attention was paid to it. Soon after the main and mizzen masts of the bark were carried away. The life-boat could not reach her. Later her name was read by a telescope, as the Pantzer, and the crew of the life-saving station succeeded in firing a life-line over her. There was something strange in the fact that while the danger seemed great the crew neither recognized the signal kept flying, nor hauled in on the life-line, their only chance for safety. A surf-boat from the wreckers succeeded in boarding the other stranded barks and found them to be the Italian barks Franceshino and Monte Tabor. Telegrams were sent by the Signal Service men to Baltimore, asking for additional aid, anchors, cables, and tugs.

Late in the day, and sometime in the afternoon, the Pantzer showed the "answering signal" of the International code. The vessel was then ascertained to be a Norwegian bark, and it is supposed her crew had not before realized that on a foreign coast she could ask for aid. Almost immediately after her signal was answered, the Pantzer signaled "Please send a life-boat." In response to this the signal station showed the signal, "Haul in on the line"; it seeming that in all the danger the crew of the bark were not aware of the uses of this line, which had been fired across her deck early in the morning. The line was at once hauled on board the Pantzer, the crews of the life-saving stations had made the life-car ready, and by nine o'clock at night her crew, eleven men all told, were safely landed. In the rough weather which followed, this vessel went to pieces. Of the others the ship Winchester was gotten off after some days' labor, and the two barks Franceshino and Monte Tabor saved without great difficulty. (Paper 44.)

The instances of these disasters have been cited at length to show in how many ways the non-commissioned officers and men of the service may be called upon to act, and how in a single instance the service of one station may be instrumental in saving human life and property of very great value. Had no Signal Service existed, there would have been no telegraphic wire to Cape Henry; had there been telegraphic wires to Cape Henry without the Signal Service, there would have been no non-commissioned officer or men capable, of at once working the electric wires and of communicating with vessels by international signals. Had either of these been wanting, it is quite likely that very valuable vessels would have been totally lost, because aid could not have been quickly enough called for from adjacent ports, nor could theefforts of the salvors have been wisely or safely directed without the constant knowledge of the weather-changes, had, as they were, during all the time the vessels were endangered. The crew of the Pantzer could not have learned how to draw on board of their vessel the life-car, and might have perished. The wreckers would not have been present, as they were, to aid in the unusual case of four vessels stranded together, and the crews of the life-saving stations could not have had, as they did, the immediate supervision of their chief (the chief of the life-saving service) at Washington. As a test of skill exercised in communication, it is pleasant to consider that vessels of two different nations, the English and the Norwegian, sailing from distant ports, and finding themselves together in distress on the coast of the United States, found also such provisi on there made, that each could make known his wants, each in his own language, as if on their own coasts at home. They were, perhaps, even more promptly succored than they would have been on a foreign coast.

In the several occurrences of the wrecks of the L'Amerique, the Rusland, and the United States ship Huron, the first knowledge had of them

at the aiding-ports was received over the wires of these sea-coast lines, and a station being established without delay at the scenes of the wrecks, as is the standing order in the service in such cases, the lines were capable of rendering indispensable assistance.

The observations and reports made upon the character of the sea-swell at these stations have been referred to in the preceding reports. The character of the sea-swell, and the direction in which it is moving, give indications often of the course in which, and the force with which storms are moving at sea, when there may be very little other evidence of their existence. This fact has long been well known to sea-shore men, to farmers and others residing near exposed coasts. Systematic observation of the character of the sea-swell for scientific uses, was not, however, practiced in this country until the establishment of the sea-coast stations. In the summer of 1873, while a cyclone of unusual destructiveness, and which afterwards devastated the coasts and bays to the northeast of the United States, wrecking a total of at least six hundred craft of different sizes, was passing over the Bermuda Islands, the long-dead swell caused by it was running into the mouth of New York Harbor. There were no other local signs of its approach. The day was bright with sunshine, a few white fleecy clouds were floating slowly in the air, the temperature not unusually high, and there was no wind. This storm struck no part of our coast east of Boston, and was felt hardly at all in New York Harbor. The sole local evidence of its existence was the sea-swell referred to, and which had outrun the storm by seven hundred miles. Every transatlantic steamer starting from New York on that day, ran into the storm, encountering different degrees of its force before midnight; while in its fury it endangered some of the most powerful ships.

It is not doubted that as this storm passed from south to north along the whole eastern coast of the United States, the swell everywhere foreran it, and announced its movement. There was, at that time, not a single sea-coast station in the service of the United States.

As farther evidencing the importance of the study of the sea-swell, the case of the steamer Albemarle is cited. This vessel, commanded by a skillful officer, on her voyage from Halifax to the Bermudas, encountered, one pleasant morning, the forerunning sea-swell of this cyclone. The vessel was hove to from 10 a. m. until 2 p. m., while her captain examined the sea-swell, his instruments, and the appearance of the sky. At 2 p. m., concluding that the storm was advancing directly upon the point where the ship was lying, the course of the vessel was changed from southerly to westerly, and by this action carried so far out of the track of the storm as to arrive afterward at the Bermudas without having encountered it.

It is the duty of this office to warn shipping, so far as is practicable, not only of storms which may reach our coast, but of those which pass near it. The sea-coast stations contribute so much to successful study for this purpose, that they would be maintained if they had no other uses.

During the year ending June 30, 1877, the sea-coast was visited by two severe storms, which proved destructive to the sea-coast telegraph line. The first of these storms occurred September 17, 1876, and the second on the dates April 9 and 10, 1877. In the storm of September 17 the telegraphic cables at Oregon and Ocracoke Inlets were lost; the inlets were widened by the storm, the beach itself being for a considerable distance washed away. The coast-line connecting Cape Hatteras and Wilmington was almost entirely destroyed.

These cases of disaster are reported in order that it may be under-

stood under what difficulties the sea-coast lines must be maintained. It is held to be necessary to maintain these lines, and it is needed to determine what location and structure will serve this end. To be as useful as it ought to be, a sea-coast line must be practically on the sea-beach itself. Whatever may be the difficulties of maintaining it, these difficulties must be faced. There is no time for the slow pace of messengers or for horses ridden through the sand when wrecked ships are calling for aid. The lightning-message is not too speedy. The saving of a single ship or a single life compensates the cost for repairs exceptional gales and sea-surges, tearing away the soil of the beach itself, may make necessary. The progress of electric communication opens fields of usefulness now so wide that it would be criminal to turn from them. The regular sea-coast line once standing, the telephone bids fair to make it possible to speak to every point on the beach or to every wrecked vessel to which a line can be thrown or carried. The time is not far distant when the possession of a coast not covered by a sea-coast telegraph, not guarded by a sea-coast storm-signal and signal service, and not supplied with the force and means of aid at life-saving stations, will be held as much an evidence of semi-barbarism as is now among civilized nations the holding of any national coast without a system of light-house lights. Foreign commerce will flow toward the safest coast. Domestic commerce will there be more remunerative. The United States have first taken the first steps for such protections. So far as is known at this office, they do not regret it.

Lieut. A. W. Greely, acting signal-officer, inspected the sea-coast line from Norfolk to Smithville, in compliance with Special Orders 189, dated November 27, 1876, and upon his return, Lieut. C. A. Booth, acting signal-officer, was ordered, with a working party of Signal Service men, to repair the lines south of Cape Hatteras. He is still engaged upon the work.

Experiments have been made by Lieutenant Booth in the use of iron poles on low beaches which are liable to be entirely covered by water, and it is believed they can be used with great advantage. A number of these poles were used on the low beach immediately below Ocracoke Inlet, and, although they have at times been entirely covered by water, the sea-level rising and remaining for some hours above the tops of the poles, only one of them has been lost, and that was carried away by a small vessel which was dragged across the beach during the storm of April 9 and 10, 1877.

Temporary stations were established on the north and south sides of Oregon Inlet, December 21, 1876, and communication maintained across the inlet by means of flag and torch signals while the telegraphic cable remained disabled. A temporary station was also opened at Ocracoke, on the north side of the inlet of the same name, and telegraphing kept up by flags and torches, keeping thus, in connection with the telegraphic wires, communication from Cape Hatteras to the office of the Chief Signal-Officer until a cable could be relaid.

In the storm of April 9 and 10 the line between Cape Henry and Kittyhawk was prostrated, several hundred poles and several miles of wire being washed away. At this date a working party, under command of Lieut. C. A. Tingle, acting signal-officer, is repairing the line, and every effort is being made to render it secure.

During the storm of September 17, 1876, the north head of Barnegat Inlet was washed away, the width of the inlet increased, and the end of cable lost. As the end could not be found, it was necessary to underrun the cable from the south side. This was done, and all but 500 yards

of the cable secured. A splice was made April 13, 1877, and direct telegraphic communication with this office resumed.

A temporary station was established on north side of Barnegat Inlet, January 13, 1877. Communication opened, and all meteorological and other reports were transmitted by flag and torch until the cable was in working order.

The line on the New Jersey coast has been entirely reinsulated north of Cape May. The entire number of miles reinsulated on this line was 129.

The total number of messages received over the sea-coast line during the year ending June 30, 1877, was 6,317; the total number sent in same period was 3,607, or a total of 9,924 messages received and sent, which would have cost, at regular rates, $10,221.34.

This description has been thus minute because it is desired to show that a force of trained soldiers, doing a land duty on shore, displaying signals hoisted on land, though answered from ships; watching, as sentinels, each his special "beat" of sea and shore; telegraphing messages, by electric wires, to summon aid; or telegraphing them by the same flag and torch signals they use in war when the lines are gone; erecting and keeping up their own wire lines of telegraph; displaying storm warnings by day or at night; making the regular meteorological observations, that the warnings may be ordered; in effect, a regular sentinel force, to warn and to aid in any danger, all in strict military subordination to each other by their grades, and all to the central office, are a force of soldiers as usefully employed for purposes of peace, and as ready, by training, for war, as a force can be kept.

In pursuance of the acts of Congress authorizing the construction and operation of telegraphic lines in the interior and upon the frontier, for connecting military posts and stations, and for the protection of the populations from Indian and other depredations, officers and enlisted men of the Signal Service have been continued upon these duties. The lines in Arizona, New Mexico, and upon the Texan frontier are nearly completed. The work of construction has been in great part done by working parties furnished by the active co-operation of department commanders. A total length of three thousand two hundred miles of line is now operated and maintained in the care of officers and enlisted men of the Signal Service.

A telegraph line well worked forms one of the most efficient of barriers against the raids of Indian war parties. The country on our frontier through which such parties pass has but few points at which water can be had. The posts occupied by the Army are scattered along the line at intervals of several hundreds of miles. The object in view, with Indian war parties, is to pass between the posts and settlements without disturbing any of them; and they very much dread to leave any danger in their rear, or to so alarm the country as to cause their retreat to be cut off in their return toward the region occupied by their tribe. The existence of the telegraph line enhances both these dangers. It is useless to break it as the parties pass toward the scene of their incursion, for this alarms both the posts or settlements on both sides of the break, and brings repair-men and guards at once to the point of the break and upon their trail; nor does it stop communication between the posts, for the messages may be sent circuitously by other wires perhaps covering hundreds of miles of distance around the point at which the line has been disabled. If the wire is not broken when the trail passes the line, the troops can of course be very readily called upon whenever the number of the parties may be discovered. But even if the line is passed safely

and the trail is not detected, the danger the electric wires cause is not ended. Wherever the party may strike, if the blow falls near any settlement or station connected with the telegraphic network, the alarm becomes in a few hours general. The troops on the line they have just passed know there is a war party in the field; other troops and other settlements can be aroused. The line of the Indian retreat, the points they must pass to reach water, are approximately known, and while the pursuit goes on in the field other forces can occupy these passes and points in advance of the flying tribe. There can be no constructions more important for holding a frontier or protecting the first steps of advancing civilization than the telegraphic lines. In a number of cases occurring in Texas, New Mexico, and Arizona, since the date of the last annual report, the movement of troops and of material, directed by telegraph, upon alarms sent by telegraph from settlements, upon the frontier system of lines, have been so timely as to have attained results which could not, without the rapid action made possible by the lines, been hoped for. How much of life or property has been saved by attacks thus guarded against, and which might else have been made on defenseless communities, can be conjectured only. (Paper 46.)

From each of the stations on the telegraphic lines thus in charge of the Signal Office, a daily report is had and used, the whole forming a valuable portion of the system of reports each day discussed. There is no reason why the working of the lines, thus doubly useful, should not be economically and successfully conducted. The saving in the cost of these reports, and the sums received for messages, make the lines in part self-supporting.

Aside from the benefits resulting from the connection of military posts, and the incidental protections the stations at frontier villages upon the lines give the country through which they pass, thus aiding its development and advancing the commercial interests, the meteorological information such lines make available is useful for other duties of the Signal Service. The existence of the lines in the interior of Texas permit warnings to be exhibited on the coast of that State where they were before impracticable. The lines in Southern Arizona and New Mexico make possible reports—having a relation to the conditions existing over the great interior plateau—this year the subject of especial study.

The scanty force of the Signal Service will not permit it to successfully occupy the lines already contemplated in existing legislation, without additional details.

Arizona division.—Second Lieut. Philip Reade, acting signal-officer, has remained in immediate charge of the lines in this division. Ninety-five miles of line between Camp Grant, Ariz., and Ralston, N. Mex., have been built during the year, completing thus the line of connection between Arizona and New Mexico. The greater portion of the line between Camp Grant and Tucson, Ariz., has been rebuilt. Work is in progress upon the line between Camp Grant and Camp Apache, and telegraphic communication between these points will be established at an early date.

In addition to the above work it has been found necessary, owing to frequent storms and the inferior character of the supports used in the construction of the original line, to reset and repair the entire line from Tucson to Camp Verde, and from Maricopa Wells to a point twenty miles west of Yuma, a total distance of nearly five hundred miles. This has involved a great amount of labor, owing to the scarcity of timber adjacent to the line and the difficulties of transportation.

The following stations were in operation June 30, 1877: San Diego,

Campo, Yuma, Stanwix, Maricopa Wells, Florence, Tucson, Wickenburg, Prescott, Camp Verde, Phœnix, Camp Grant, and Camp Bowie—thirteen in all; of these, Camp Bowie was added during the year. One station, that of Camp Lowell, has been discontinued, as the operator was needed to open and work the new station at Bowie. The stations at Yuma, Stanwix, Camp Verde, Grant, Tucson, Florence and Maricopa Wells make full tri-daily meteorological reports to the central office in Washington, and all stations on the line make one afternoon report daily.

The total receipts of the line for the year ending June 30, 1877, were $19,912.13, of which amount $11,122.13 was from this line, and $8,789.90 other line receipts.

The amount of official free business done during the same period, computed at regular rates, was $9,292.25, without including the meteorological reports, or the daily press reports furnished military posts on the lines as a matter of courtesy.

The total number of enlisted men of the Signal Service on duty in this division June 30, 1876, was twenty-one; the number assigned during the year, ten; the loss by discharge, six; by death, two; by desertion, one, and by transfer one. The total number on duty June 30, 1877, was twenty-one.

New Mexican Division.—Second Lieut. S. C. Vedder, acting signal-officer, remains in charge of the telegraph-lines in this division.

At the close of the fiscal year ending June 30, 1876, offices had been opened for the transaction of business at the following-named places: Santa Fé, Albuqurque, Belen, Fort Craig, Fort Selden, Fort Bayard, and Silver City; seven in all. During the year ending June 30, 1877, offices were opened at La Mesilla, July 13, 1876; Los Lunas, December 20, 1876; at Socorro, January 1, 1877; and at Los Cruces, April 10, 1877. All of these stations were in operation June 30, 1877, except Socorro, which was closed June 6, 1877, for want of means with which to maintain it, and Los Cruces discontinued for the same reason at the close of the year.

The line has been extended from Silver City to the Territorial boundary between New Mexico and Arizona, where its junction with the Arizona lines completed the continuous telegraphic connection between Santa Fé, N. Mex., and San Diego, Cal., before referred to; the junction being made on May 4, 1877.

The working party under Lieutenant Vedder's charge continued work beyond Ralston to the Territorial line, a distance of twenty-two miles. The Territorial line was reached May 4, 1877. Arrangements have been made to extend this line from Mesilla to El Paso as soon as a working detail can be secured. The poles or supports for this extension were furnished by the citizens of New Mexico, in order to obtain telegraphic communication with El Paso at as early a date as practicable.

The number of enlisted men on duty in this division June 30, 1876, was seven. The number June 30, 1877, was five. One man was discharged, one died, and two were relieved during the year. Two were assigned to partially replace these losses.

The total receipts of the line for the year ending June 30, 1877, was $5,794.96, of which amount $3,436.16 was for this line, and $2,350.80 other line tariff. The amount of official free business for the same period was $1,771.83.

Texas Divison.—First Lieut. James A. Buchanan, Fourteenth Infantry, and acting signal officer, was, by direction of the Secretary of War, assigned to the charge of the line by Special Orders No. 14, paragraph 5, Headquarters of the Army, Adjutant-General's Office, dated Washing-

ton, July 24, 1876, and relieved by Special Orders No. 160, paragraph 3, Headquarters of the Army, Adjutant-General's Office, dated Washington, August 5, 1876.

First Lieut. George S. Grimes, second Artillery, and acting signal officer, was assigned to the charge of the line by Special Orders No. 160, paragraph 3, Headquarters of the Army, Adjutant-General's Office, dated Washington, August 5, 1876, and still remains.

The following-named stations were in operation June 30, 1876: Denison, Pilot Point, Decatur, Jacksboro', Cambridge, Fort Sill, Graham, Griffin, Camp Colorado, Concho, Stockton, McKavett, Mason, Fredericksburg, Comfort, Boerne, San Antonio, Castroville, Uvalde, Brackettville, Eagle Pass, Laredo, Rio Grande City, Edinburg, and Brownsville; in all twenty-five stations. These stations were all in operation June 30, 1877, except that at Comfort, closed December 7, 1876, and that at Camp Colorado, closed March 31, 1877.

The following-stations were established during the year ending June 30, 1877: Coleman City, Tex., opened April 1, 1877; Henrietta, Tex., opened February 1, 1877; D'Hannis, Tex., opened June 1, 1877. The total number of stations in operation June 30, 1877, was twenty-six, of which nineteen were operated by enlisted men of the Signal Service and seven by civilians. The total number of enlisted men of the Signal Service on duty in this division June 30, 1876, was thirty-one. The number on duty June 30, 1877, was thirty. Number of enlisted men relieved during the year was two; the number discharged was nine, and the number assigned to duty ten. The number of civilian operators on duty June 30, 1876, was five; number on duty June 30, 1877, was nine, making a total force, enlisted and civilian, on the latter date, of thirty-nine men.

In addition to the telegraphic work required of operators, the Signal-Service men in charge of stations perform also the duties of meteorological observers.

The following stations report in full tri-daily by telegraph to the central office: Denison, Jacksboro', Fort Sill, Griffin, Concho, Stockton, Mason, San Antonio, Brackettville, Eagle Pass, Laredo, and Brownsville; twelve in all. The reports from these stations are collected and consolidated at Denison before transmission to Washington. From all other stations in this division, except D'Hannis and Henrietta, one full meteorological report is telegraphed every afternoon. A special report of the condition of the weather, at the time of sunset, is made out from every station on the line, and telegraphed at 8 p. m. to the central office in Washington.

All the stations in this division have been inspected during the year. Those north of San Antonio were inspected twice; once by Lieut. Geo. S. Grimes, in September and October, 1876, and again by Lieut. A. W. Greely during the months of February, March, and April, 1877. The stations south of San Antonio were inspected during the months of May and June, 1877, by Lieutenants Greely and Grimes.

Large portions of line have been reinsulated during the year; other repairs have been made, and the line is now reported in fair condition. Many repairs will be needed during the ensuing year to maintain prompt and regular communication. In some places portions of the line will need to be rebuilt. Repair-parties have been furnished by the garrisons at Eagle Pass, Laredo, Rio Grande City, and Brownsville. The commanding officers at all posts lying along the lines have responded cheerfully, under the general instructions of the general commanding the

department, to requests made upon them for assistance in men and transportation for the maintenance of line.

The aggregate cash receipts from telegraphic tolls on messages sent over the lines of this division for the year ending June 30, 1877, were $22,947.76, of which amount $16,076.78 was for the military-line tariff, and $6,870.98 for other lines. The money-value, at regular tariff-rates of official messages of the War Department and other free official business transmitted from and to the different offices along the line during the year, amounted to $9,249.85.

There have been many difficulties of administration and execution to be encountered in the construction and working of the lines thus reported. The work was a new one; the country considered impracticable for telegraphic construction. The appropriations and the force are small. There were oppositions which were not wise. These inconveniences disappear one by one as they are encountered. That it was essential for the safety and development of the country that these lines should exist, is not now disputed. The mode in which best to construct, maintain, and manage them is taught by experience.

The construction of telegraphic lines upon iron supports has been, within the year, tested on lines between this office and Fort Whipple and on the sea-coast. It seems now to be indicated that the use of such supports may solve the great difficulty of the want of timber-supply in the barren interior and that of transportation. The difficulties of working are found to exist while lines are new, necessarily imperfect in parts, and while the force is not yet disciplined to the regular, steady, and increasing daily work and the occurrences incident to the inconvenience of the construction and repair through sparsely-settled Territories on routes without railways, and threatened always by Indians or other hostile forces.

The office is called upon to recognize the courteous and prompt aid with which the wishes of the Secretary of War have been met on the part of division, department, and district commanders, and the zeal with which the working parties of troops by them detailed have performed their duties.

Unless in the presence of insuperable difficulties, no request for assistance has been made which has failed of attention. It is hoped the aid thus received from General E. O. C. Ord, commanding Department of Texas, General John Pope, commanding Department of Missouri, General Edward Hatch, commanding District of New Mexico, and General A. V. Kautz, commanding Department of Arizona, will be justified by the success in the several spheres of their duty the lines may secure to the military operations under their command.

The Chief Signal-Officer earnestly recommends legislation for a more complete organization of the Signal Service. With duties now as extensive, as important, and reaching directly more interests of the people of the United States than those of any other bureau of the War Department, it exists without laws providing for the permanent employment and grades of its officers, or the higher military promotion of its enlisted men. This condition is found to seriously embarrass the work of the office. The subject of such organization received last year, and in the year preceding, careful attention, and was favorably recommended by the President to Congress. The experience of the year has demonstrated the need of it. If the service is to advance to greater success, it cannot be too safely guarded against possible hamperings, or offer too certain rewards for faithful service. The organization is neces sarily military. Responsibility for human life as well as for property

rests on the work of this office. The extent is great. It requires careful organization and rigid discipline. Neither officer nor man must hesitate to act on an order. Skill in its duties and the habit of them improve with experience. Both are out of the line of commercial profit. The certainty of honorable employment, the equal certainty of some reward to follow years of faithful duty, is the right of men so serving.

The results for the year give cause for encouragement. It has been marked by the fact that it has, in its incidents, called into action every one of the particular duties of the Signal Service, as provided both for peace and war. The useful preannouncement of approaching meteoric changes is admitted as established by now seven years' continuous practice. Wise criticism demands each year improving accuracy. With each year the paths for improvement, the evidences of success, have become more visible. The work has gained in simplicity and extent. The co-operation of true scientists has continued both at home and abroad. The uses of the service, and the results to be hoped from its future development, have been appreciated. The popular support, and the support of the press, have been steady and considerate. The service advances not always by smooth paths, but to a certain success.

ALBERT J. MYER,
Brig. Gen. (Bvt. Assgd.), Chief Signal-Officer U. S. A.

Hon. G. W. McCRARY,
Secretary of War.

PAPER 1.

COURSE AT FORT WHIPPLE, VIRGINIA.

(Exclusive of the drills in the arms, with trains or for permanent constructions.)

OFFICERS.

The course of instruction for officers is both practical and theoretical. The theoretical portion comprises instruction in the following books, viz: The Manual of Signals, Pope's Practical Telegraphy, Culley's Hand-book of Telegraphy, Loomis's Meteorology, Instructions to Observer Sergeants, the Cipher Manual. The supplementary course of reading comprises in the cases of officers permanently detailed for the full duties of the Signal Service, in addition to especial works from time to time designated: The Practical Uses of Meteorological Reports and Weather Maps, Smithsonian Directions for Meteorological Observations, Buchan's Handy Book of Meteorology, Piddington's Horn Book, Espy's Philosophy of Storms, Fitz Roy's Weather Book, Martin's Rotary Theory of Storms, Ley's Laws of the Winds, Espy's First Meteorological Report, Espy's Fourth Meteorological Report. The practical portion consists of wand practice, which is continued until the officer can read messages at the rate of ten words per minute; practice in the field with flag and torch in general service; homographic, chronosemic, and international codes of flag-signals and various kinds of ciphers, and practice with the heliograph in the general-service code.

The ranges for practice are from a few hundred yards to eighteen miles in extent with flag and torch, and extreme long range of thirty-one miles with the heliograph.

The officers have practical instruction in telegraphy (General Service Code) until they can send and receive at the rate of ten words per minute, and are required to make drawings of the various telegraph instruments and electrical batteries in use in the Signal Service.

ENLISTED MEN.

1. Candidates for promotion to the grade of sergeants:

The course comprises theoretical instruction in the Manual of Signals, Pope's Practical Telegraphy, Loomis's Meteorology, the Instructions to Observer Sergeants, and practical instructions in field-signals (General Service and International Codes), in the Morse Code of Telegraphy, and in the care of electrical batteries.

2. The theoretical course for assistants to observer sergeants comprises instruction in Loomis's Meteorology, Instructions to Observer Sergeants, and the portion of Pope's Telegraphy relating to instruments and batteries. The course comprises instruction in Morse Code of Telegraphy and observatory duty.

All enlisted men are required to be able to send and receive, in the Morse Code, at the uniform rate of ten words per minute before being considered competent for station duty.

All enlisted men, before being placed under instructions as assistants to observer sergeants, have practical instruction in the general service code.

PAPER 2.

RECORD OF SIGNAL CAMP OF INSTRUCTION, FORT WHIPPLE, VIRGINIA.

Officers instructed during the year ending June 30, 1877.

Name.	Rank and corps.	Reported for instruction.	Relieved from instruction.	Remarks.
C. A. Booth	2d lieut. 1st Infantry	Dec. 23, 1875	July 24, 1876	Completed full course of signaling, telegraphy, and meteorology.
J. L. Clem	1st lieut. 24th Infantry	Aug. 26, 1876	Feb. 1, 1877	Completed course of meteorology.
F. S. Rice	2d lieut. 1st Artillery	Sept. 3, 1876	May 2, 1877	Completed full course of signaling, telegraphy, and meteorology.
C. A. Tingle	2d lieut. 2d Artillery	Sept. 4, 1876	May 2, 1877	Do.
T. H. Barber	1st lieut. 1st Artillery	Sept. 4, 1876	May 2, 1877	Do.

PAPER 3.

Amount of field-practice had by each officer.

Name.	Rank and corps.	Number of days flag-practice was had.	Number of nights torch-practice was had.	Remarks.
J. L. Clem	1st lieut. 24th Infantry	29	4	
F. S. Rice	2d lieut. 1st Artillery	30	10	
C. A. Tingle	2d lieut. 2d Artillery	28	9	
T. H. Barber	1st lieut. 1st Artillery	31	7	

PAPER 4.

Table showing the instruction of candidates for the grade of sergeant from July 1, 1876, to June 30, 1877.

Name.	Instruction commenced.	Date of promotion.	Remarks.
John A. Cody	Apr. 5, 1876	July 1, 1876	In charge of station at St. Marks, Fla.
Nicholas G. Brewer	Apr. 6, 1876	July 1, 1876	Reduced to the ranks for misconduct April 5, 1877, now on duty as assistant at Wilmington, N. C.
Joseph E. Mayhew	Apr. 20, 1876	July 1, 1876	On duty at Fort Whipple, Va.
William Dowes	July 12, 1876	Nov. 1, 1876	On duty as telegraph operator at Fort Sill, Ind. Ter.
James C. Franklin	July 12, 1876	.....	Dropped from instruction July 22, 1876.
Edward F. Kubel	July 28, 1876	Nov. 13, 1876	In charge of station at Olympia, Wash.
Rupert R. Rodgers	Aug. 1, 1876	Nov. 1, 1876	In charge of station at Red Bluff, Cal.
George W. Hay	Aug. 3, 1876	Nov. 1, 1876	In charge of station at Pittsburgh, Pa.
Orin Parker	Aug. 5, 1876	Nov. 1, 1876	In charge of station at Boston, Mass.
James Gilligan	Aug. 5, 1876	Feb. 1, 1877	In charge of station at Escanaba, Mich.
Herbert S. Foster	Aug. 5, 1876	Feb. 10, 1877	In charge of station at Indianola, Tex.
Marion M. Sickler	Aug. 5, 1876	Nov. 1, 1876	In charge of station at San Diego, Cal.
Barnet R. Light	Aug. 9, 1876	Nov. 1, 1876	In charge of station at Boisé City, Idaho.
David T. Flannery	Oct. 23, 1876	Feb. 10, 1877	In charge of station at Bismarck, Dak.
Luther M. Dey	Oct. 24, 1876	Feb. 10, 1877	Temporarily on duty at Cleveland, Ohio.
Francis Pierce	Oct. 27, 1876	Feb. 10, 1877	In charge of station at Barnegat, N. J.
John T. O'Keeffe	Nov. 17, 1876	Feb. 10, 1877	In charge of station at Lynchburg, Va.

PAPER 5.

Enlisted men instructed for the position of assistant to non-commissioned officers in charge of stations from July 1, 1876, to June 30, 1877.

Name.	Placed under instruction for assistant.	Reported qualified as assistant.	Ordered on station.	Remarks.
Andrew T. Sherwood	May 27, 1876	July 1, 1876	July 7, 1876	In charge of station at Oregon Inlet, N. C.
Henry E. Williams	May 27, 1876	July 1, 1876	July 13, 1876	On duty as assistant at Rochester, N. Y.
Frederic E. Seegelken	May 27, 1876	July 8, 1876	Aug. 22, 1876	On duty as assistant at Cape Henry, Va.
William A. Reid	May 27, 1876	July 15, 1876	Oct. 11, 1876	On duty as assistant at Cincinnati, Ohio.
James A. Perkins	June 12, 1876	July 15, 1876	Aug. 17, 1876	On duty as assistant at Kitty-hawk, N. C.
Edgar B. Dosier	July 10, 1876	Aug. 26, 1876	Oct. 11, 1876	On duty as assistant at Buffalo, N. Y.
Austin C. Sweet	July 10, 1876	Aug. 26, 1876	.....	Discharged the service of the United States Sept. 6, 1876.
James L. Barrett	July 10, 1876	Sept. 2, 1876	Oct. 11, 1876	On duty as assistant at Pike's Peak, Colo.
Frederick Belford	July 10, 1876	Sept. 16, 1876	Oct. 10, 1876	On duty as telegraph-operator at Eagle Pass, Tex.
Henry J. Hayden	July 10, 1876	Sept. 16, 1876	.....	Discharged the service of the United States Oct. 11, 1876.
William W. Eichelberger	Aug. 5, 1876	Sept. 23, 1876	Oct. 11, 1876	On duty as assistant at Boston, Mass.
Louis H. Albrecht	Aug. 5, 1876	Sept. 23, 1876	Oct. 8, 1876	On duty at office of Chief Signal-Officer.
Richard J. Somers	Aug. 5, 1876	.....	Aug. 11, 1876	On duty as telegraph-operator at Decatur, Tex.
Peter C. Guthrie	Aug. 5, 1876	Oct. 7, 1876	Nov. 3, 1876	On duty as assistant at Cairo, Ill.
Eneas Dougherty	Aug. 17, 1876	Nov. 4, 1876	.....	Dropped from instruction Dec. 12, 1876.
Henry White	Aug. 17, 1876	Dec. 2, 1876	Dec. 11, 1876	On duty as assistant at Savannah Ga.
William J. Dailey	Aug. 17, 1876	.....	Aug. 18, 1876	On duty as telegraph-operator at Stanwix, Ariz.
James Kenealy	Aug. 28, 1876	.....	Nov. 7, 1876	On duty as assistant at Galveston, Tex.
Charles N. Kitchel	Aug. 28, 1876	Dec. 2, 1876	Feb. 6, 1877	On duty at office of Chief Signal-Officer.
Fred L. Pinkham	Dec. 5, 1876	Dec. 23, 1876	Jan. 2, 1877	On duty as assistant at Augusta, Ga.
Edward W. Nelson	Feb. 14, 1877	.....	Mar. 15, 1877	In charge of station at Fort St. Michael's, Alaska.
Thomas B. Harrison	Feb. 22, 1877	Mar. 24, 1877	Mar. 26, 1877	On duty at Fort Whipple, Va.
Edwin C. Goss	Feb. 22, 1877	Apr. 21, 1877	Apr. 24, 1877	On duty as assistant at Sandy Hook, N. J.
Edwin C. Imlay	Feb. 22, 1877	May 19, 1877	May 22, 1877	On duty as assistant at Mobile, Ala.
Oscar W. White	Feb. 22, 1877	.....	Apr. 2, 1877	On duty as telegraph-operator at Yuma, Ariz.
Benjamin L. Goulding	Feb. 22, 1877	Apr. 21, 1877	May 7, 1877	On duty as assistant at New London, Conn.
Arthur A. Webb	Feb. 22, 1877	Apr. 7, 1877	Apr. 20, 1877	On duty as assistant at Smithville, N. C.
Henry S. Grayson	Apr. 3, 1877	.....	May 22, 1877	On duty as assistant at Cape May, N. J.
Lee B. Roberts	Apr. 3, 1877	May 19, 1877	May 18, 1877	On duty at office of Chief Signal-Officer.
Hill C. Smyth	Apr. 4, 1877	.....	June 15, 1877	On duty as assistant at Cincinnati, Ohio.
Charles C. M. Loeffler	Apr. 4, 1877	June 16, 1877	June 21, 1877	On duty at office of Chief Signal-Officer.
George V. Russell	Apr. 3, 1877	June 23, 1877	June 22, 1877	On duty as assistant at Eastport-Me.
James A. Gleason	Apr. 3, 1877	.....	May 25, 1877	On duty as assistant at Norfolk, Va.
Thomas A. Donahoe	Apr. 26, 1877	.....	.....	Still under instruction.
Charles P. Rowley	Apr. 26, 1877	.....	.....	Do.
John P. Finley	Apr. 26, 1877	.....	.....	Do.
Alexander Pollak	Apr. 26, 1877	.....	.....	Do.
Edward F. Reeves	Apr. 26, 1877	.....	.....	Do.
John M. Marr	May 1, 1877	.....	.....	On duty at Norfolk, Va.

Enlisted men instructed for position of assistant, &c.—Continued.

Name.	Placed under instruction for assistant.	Reported qualified as assistant.	Ordered on station.	Remarks.
Thomas McCarty	May 2, 1877	May 26, 1877	May 28, 1877	On duty as assistant at St. Paul, Minn.
Thomas T. O'Leary	May 9, 1877			Still under instruction.
Paul Daniels	June 3, 1877			Do.
Richard P. Sibley	June 3, 1877			Do.
Rufus Choate	June 3, 1877			Do.
Fielder L Hunter	June 3, 1877			Do.
Russell Chapman, jr	June 3, 1877			Do.
Joseph E. Miller	June 3, 1877			Do.

PAPER 6.

Exhibiting the communications sent from and received at the office of the Chief Signal-Officer (exclusive of telegrams) from July 1, 1876, to June 30, 1877.

SENT.

Division of telegrams and reports for the benefit of commerce and agriculture.

To heads of departments and bureaus	288
To non-commissioned officers in charge of stations in reference to their duties	7,934
In reply to applications for stations and others similar	3
To telegraph companies, in reference to transmission of weather-reports and the erection of telegraph-lines, &c	273
To boards of trade, chambers of commerce, agricultural societies, &c	284
To postmasters, in reference to weather-bulletins	1,714
To foreign correspondents, relating to this division in general	54
To foreign correspondents, relating to simultaneous reports	1,072
To volunteer observers throughout the United States	240
General and special orders and circulars, with reference to this division	12,009
Miscellaneous	802
Total	24,873

Signal division.

To heads of departments and bureaus	200
Relating to duties and discipline at signal-service school of instruction and post of Fort Whipple, Va	412
Relating to recruiting and enlistment	425
Answers to applications for enlistment in the signal-service United States Army	372
General and special orders and circulars, with reference to this division	3,767
Miscellaneous	385
Total	5,561

Property division.

To heads of departments and bureaus	2,100
To manufacturers and others, in reference to instruments, equipments, &c	1,362
To non-commissioned officers in charge of stations, and other enlisted men in reference to property and money accounts	9,895
In reference to quarterly returns of officers	1,500
Regarding property transferred to stations	3,608
Miscellaneous	3,643
Total	22,108
Aggregate	52,342

RECEIVED.

Division of telegrams and reports for the benefit of commerce and agriculture.

From heads of departments and bureaus	170
Applications for the establishment of new stations	21
From telegraph companies, in reference to the transmission of weather-reports and the construction of telegraph-lines, &c	87
From non-commissioned officers in charge of stations, in reference to their duties	11,703
From boards of trade, chambers of commerce, and agricultural societies	127
From foreign correspondents, relating to simultaneous weather-reports	4,531
From volunteer observers throughout the United States, relating to observations and reports	5,660
From foreign correspondents, relating to this division in general	81
Reports relative to instruction of non-commissioned officers and assistants	2,066
Mailed reports from non-commissioned officers in charge of stations	295,070
From United States naval vessels and stations (received through the Navy Department)	310
Meteorological charts, abstracts of journals, forms, &c., received from non-commissioned officers in charge of stations	37,157
Reports from postmasters throughout the United States in reference to weather-bulletins received and posted by them	220,292
Miscellaneous	3,538
Total	640,813

Signal division.

From heads of departments and bureaus	375
Relating to duties and discipline at signal-service school of instruction and post of Fort Whipple, Va	737
Relating to instructions in signaling at Fort Whipple, Va., and in different military departments	332
Relating to recruiting and enlistment	1,073
Applications for enlistment in the signal-service United States Army	384
Miscellaneous	696
Total	3,597

Property division.

From heads of departments and bureaus	994
From manufacturers and others, relating to instruments, equipments, &c	702
From officers, concerning property, quarterly returns, &c	987
From non-commissioned officers in charge of stations and other enlisted men relating to property and money accounts	41,935
Regarding property transferred to stations	7,758
Miscellaneous	10,026
Total	62,402
Aggregate	706,812
Aggregate sent	52,342
Aggregate received	706,812
Aggregate sent and received	759,154

Table showing the number of cipher-words and messages sent and received by telegraph at the central office, Washington, D. C., from July 1, 1876, to June 30, 1877.

Cipher-words of weather-reports sent	162,633
Telegraphic messages other than weather-reports sent	8,724
Cipher-words of weather-reports received	786,775
Cipher-words of special river reports received	21,888
Telegraphic messages other than weather-reports received	9,210

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Table showing meteorological data furnished from the records of the office of the Chief Signal-Officer of the Army, upon the request of the applicants named, during the fiscal year ending June 30, 1877.

A. F. Pugh, Paincourtville, Assumption Parish, La., furnished, July 6, 1876, with a record of the stage of water in the Mississippi River at Saint Louis, Mo., on April 24, 1874, and April 20, 1876.

Lieut. H. E. Nichols, assistant hydrographic inspector, United States Coast Survey, Washington, D. C., furnished, July 6, 1876, with extracts from journals of observers at Mobile, Ala., and Saint Mark's, Fla., relating to "northers" and "southeasters" prevailing at those stations between December 7, 1875, and April 29, 1876. Also, record of barometer and thermometer and direction and velocity of the wind at the same places.

Lieut. E. H. Ruffner, Corps of Engineers, United States Army, Fort Leavenworth, Kans., furnished, July 11, 1876, with a record of the barometer (uncorrected), attached and exposed thermometers, at Dodge City, Kans., from April 25 to June 30, 1876, at 7 a. m., 2 p. m., and 9 p. m., local time.

W. P. Speakman, Lock No. 4, Washington County, Pennsylvania, furnished monthly, from July 1, 1876, to June 30, 1877, with a record of the stage of water in the Monongahela River at Pittsburgh, Pa.

The Saint Louis Board of Health furnished, July 31, 1876, with records of observations taken at the station of the Signal Service in Saint Louis, Mo.

J. De Witt, 1338 Pine street, Philadelphia, Pa., furnished, August 3, 1876, with a record of the monthly and annual maximum, minimum, and mean temperature, and monthly and annual amount of rain-fall at Galveston, Tex., from September, 1871, to June, 1876.

C. H. Leonard, M. D., 13 Griswold street, Detroit, Mich., furnished, August 3, 1876, with a record of the exposed dry and wet bulb thermometers at Philadelphia and New York City (seven observations daily) from June 16 to July 29, 1876.

Lieut. George M. Wheeler, Corps of Engineers, United States Army, Washington, D. C., furnished, August 15, 1876, with a record of barometer (corrected for instrumental error), dry-bulb thermometer, and relative humidity at San Diego, Cal., from March 1 to March 31, 1876. On March 10, 1877, with barometric and thermometric readings and relative humidity, taken at 7 a. m. and 2 and 9 p. m. at Santa Fé, N. Mex., from September 1 to December 15, 1876, and at Denver, Colo., from August 29 to December 10, 1876, inclusive; also, barometric and thermometric readings and relative humidity taken at San Francisco, Cal., from August 15, 1876, to November 30, 1876. On March 27, 1877, with a statement showing reading of barometer, dry-bulb thermometer, and relative humidity at 7 a. m., 2 p. m., and 9 p. m. at Salt Lake City, Utah, from August 16 to November 30, 1876, inclusive.

H. F. Miles, engineer Essex Company, Lawrence, Mass., furnished, August 18, 1876, with a statement of the rain-fall at Lawrence, Mass., from January, 1874, to August, 1876.

A. Whitman, box 1497, Saint Paul, Minn., furnished, September 6, 1876, with extract from record of observations made by the observer at Pembina, Dak., during the month of July, 1876, in reference to grasshoppers.

C. R. Greenleaf, surgeon, United States Army, Georgetown, D. C., furnished, September 13, 1876, with a record of monthly mean of surface and deep-water temperatures at Augusta, Ga., Cairo, Ill., Jacksonville and Saint Mark's, Fla., Knoxville, Memphis and Nashville, Tenn., Mobile and Montgomery, Ala., during the month of May, 1874, 1875, and 1876.

A. S. Packard, jr., Peabody Academy of Science, Salem, Mass., furnished, September 30, 1876, with a record of the prevailing direction of the wind at North Platte and Omaha, Nebr., Leavenworth and Dodge City, Kans., Keokuk and Davenport, Iowa, Santa Fé, N. Mex., Saint Paul and Breckenridge, Minn., Cheyenne, Wyo., Bismarck, Yankton and Fort Sully, Dak., Fort Gibson, Ind. T., Denver and Colorado Springs, Colo., from 1871 to 1876.

Dr. Charles Denison, Denver, Colo., furnished, October 2, 1876, with a record of the mean temperature, mean relative humidity, prevailing direction of the wind, and total movement of the wind from 1871 to 1876, at North Platte and Omaha, Nebr., Leavenworth and Dodge City, Kans., Keokuk and Davenport, Iowa, Santa Fé, N. Mex., Saint Paul and Breckenridge, Minn., Bismarck, Yankton and Fort Sully, Dak., Fort Gibson, Ind. T., Cheyenne, Wyo., Denver and Colorado Springs, Colo.

Messrs. Lathbury, Stearly & Co., 121 Walnut street, Philadelphia, Pa., furnished, October 17, 1876, with a record of the anemometer at Cape May, N. J., from 12 m. to 4 p. m. September 17, 1876, on May 2, 1877, with a statement showing direction and velocity of the wind at Cape Hatteras, N. C., on April 12 and 13, 1877, and on May 9, 1877, with a certified copy of Form 4, containing the record of observations taken at Cape Henry, Va., and Kittyhawk, N. C., on April 12 and 13, 1877.

Capt. H. C. Rogers, Assistant Commissioner of Internal Revenue, Washington, D. C., furnished, November 7, 1876, with a record of the maximum, minimum, and mean temperatures at Boston, Mass., Buffalo and New York City, N. Y., Charleston, S. C., Chicago, Ill., Cincinnati, Ohio, Memphis, Tenn., Montgomery, Ala., New Orleans, La., Galveston, Tex., Omaha, Nebr., Philadelphia, Pa., San Francisco, Cal., Saint Louis, Mo., Saint Paul, Minn., Washington, D. C., and Wilmington, N. C., from October, 1875, to September, 1876.

J. A. Cole, Ravenswood, Cole County, Ill., furnished, November 7, 1876, with a record of the monthly and annual amount of precipitation at Chicago, Ill., from December, 1870, to October, 1876, and at Evanston, Ill., from September, 1875, to July, 1876.

George L. Worcester, Thetford, Vt., furnished, November 23, 1876, with a record of the lowest temperature and highest velocity of the wind, observed at the summit of Mount Washington, N. H., between November, 1872, and April, 1876.

W. O. Smith & Co., 53 Exchange Place, New York City, furnished, December 7, 1876, with record of original observations taken at New York City, September 17, 1876, and a copy of the daily journal of that station for same date.

Dr. W. H. Geddings, Aiken, S. C., furnished, December 8, 1876, with a record of the maximum, minimum, and mean relative humidity at Jacksonville, Fla., from June, 1875, to August, 1876.

Capt. C. P. Patterson, Superintendent United States Coast Survey, Washington, D. C., furnished, December 6, 1876, with a record of observations taken at Saint Michael's, Alaska, from July, 1874, to June, 1876, inclusive.

A. Hyatt, Cambridge, Mass., furnished, December 11, 1876, with a record of the temperature of water at the bottom of the channels at Saint Mark's, Punta Rassa, Key West and Jacksonville, Fla., and on February 8, 1877, with a statement showing the temperature of the water at Wilmington, N. C., Charleston, S. C., Savannah, Ga., and Jacksonville, Fla., during the months of January and February, 1874, 1875, 1876, and 1877.

Dr. John D. Fish, Savannah, Ga., furnished, December 15, 1876, with tables showing the mean daily and monthly barometer, thermometer, relative humidity, prevailing direction of the wind, state of weather, and rain-fall at Savannah, Ga., during June, July, August, and September, 1875 and 1876.

W. H. Dall, United States Coast Survey, Washington, D. C., furnished, December 16, 1876, with monthly mean of meteorological observations taken at Saint Paul's Island, Alaska, from September, 1872, to June, 1876, inclusive; also sea-surface temperature at same station during 1874, 1875, and 1876.

Messrs. Gieske and Nieman, No. 78 South Charles street, Baltimore, Md., furnished, January 5, 1877, with tables showing the monthly precipitation at Cincinnati, Ohio, during June, July, August, September, October, November, and December, 1876.

P. F. Brendlinger, resident engineer, Point Bridge Company, Pittsburgh, Pa., furnished, January 5, 1877, with tables showing the velocity and pressure of the wind at certain stations of the Signal Service from May, 1874, to October, 1875.

Commodore J. C. Beaumont, United States Navy, Washington, D. C., furnished, January 9, 1877, with table exhibiting thermometric readings taken at Albany, N. Y., from January 1, 1875, to March 31, 1875, and on January 12, 1877, with a record of thermometric observations taken at Washington, D. C., at 7.35 a. m., 12 midday, and 4.35 p. m. (local time), from January 1, 1875, to March 31, 1875.

Lieut. Col. G. E. Bulger, Montreal, Canada, furnished, January 10, 1877, with a copy of chart exhibiting the direction and velocity of the wind at stations of the Signal-Service U. S. A.

William Kronberg, New York City, furnished, January 17, 1877, with copy of original record of observations made at New York City, between the hours of 8 p. m. and midnight, October 22, 1874.

Prof. F. V. Hayden, United States geologist, Washington, D. C., furnished, January 22, 1877, with table showing original reading of barometer, attached thermometer, and dry-bulb thermometer at 7 a. m., 2 and 9 p. m. (local time), at Denver, Colo., from August 17 to December 31, 1874, and from June 1 to May 1, 1875, and October 1, 1875, to October 20, 1876.

R. Scott, Oswego, N. Y., furnished, January 10, 1877, with table showing the direction of the wind at Alpena and Escanaba, Mich., October 8 and 9, 1875.

E. A. Silva, clerk of council, Savannah, Ga., furnished, January 12, 1877, with a summary of meteorological observations taken at Savannah, Ga., during the year ending December 31, 1876.

J. J. Mulheran, Detroit, Mich., furnished, January 12, 1877, with a statement of the amount of rain-fall at Fort Leavenworth, Fort Larned and Dodge City, Kans., during the years 1872, 1873, 1874, 1875, and 1876.

O. F. Davis, land commissioner Union Pacific Railroad Company, Omaha, Nebr., furnished, January 19, 1877, with a statement of the amount of rain-fall at North Platte and Omaha, Nebr., Cheyenne, Wyo., and Yankton, Dak., during the years 1874, 1875, and 1876.

V. Colvin, Adirondack survey office, Albany, N. Y., furnished, January 30, 1877, with

table exhibiting original readings of barometer (corrected for temperature, instrumental error, and reduced to sea-level), exposed, dry and wet bulb thermometers at Albany and Oswego, N. Y., and Burlington, Vt., from June 15, 1876, to November 15, 1876; on March 19, 1877, with tables showing barometric and thermometric readings taken at Albany and Oswego, N. Y., and Burlington, Vt., at 7.35 a. m., 12 midday, 4.35 p. m., and 11 p. m. (Washington mean time), from July 1, 1876, to September 30, 1876, inclusive, and temperature of the air at same stations from June 15, 1876, to November 15, 1876, at 7 a. m., 2 and 9 p. m. (local time).

W. S. Williams, civil engineer, inspector of railroad bridges and structures, Canton, Ohio, furnished, January 31, 1877, with tables showing the velocity, pressure, &c., of the wind.

Miss Austine Snead, Washington, D. C., furnished, February 1, 1877, with a statement of the velocity and pressure of the wind at Washington, D. C., at 4 p. m., January 24, 1877.

Messrs. Birney & Birney, attorneys for the District of Columbia, Washington, D. C., furnished, February 12, 1877, with copies of observations relating to the state of the weather at Washington, D. C., October 10, 1873.

G. A. Schmitt, Boston, Mass., furnished, March 7, 1877, with a statement showing the mean monthly temperature of New York City during the years 1874, 1875, and 1876.

John A. Grow, attorney at law, Washington, D. C., furnished, March 28, 1877, with table showing the mean temperature and rain-fall at Washington, D. C., from December 12, 1876, to February 6, 1877.

Prof. H. A. Newton, Yale College, New Haven, Conn., furnished, March 22, 1877, with extracts and notes relating to the meteor of December 21, 1876.

W. T. Johnson, attorney at law, Washington, D. C., furnished, March 21, 1877, with a copy of original records of observations taken at office of the Chief Signal-Officer, at 4.35 p. m. December 11, 1875.

Charles H. Steelman, secretary Vessel Owners' and Captains' Association, No. 205½ Walnut street, Philadelphia, Pa., furnished, March 31, 1877, with a statement showing temperature of the air, direction and velocity of the wind, precipitation, and state of weather at Eastport and Portland, Me., Boston, Mass., and Halifax, Nova Scotia, from January 12 to February 28, 1877, inclusive.

P. F. Loper, jr., Stonington, Conn., furnished, April 4, 1877, with a statement showing amount of rain-fall, velocity and prevailing direction of the wind, and lowest barometer at New London, Conn., from March 25 to March 29, 1877.

N. L. Davis, 65 Randolph street, Chicago, Ill., furnished, April 27, 1877, with a statement showing daily maximum and minimum temperatures, monthly and daily range, and monthly means of temperature at Cairo, Ill., Davenport, Iowa, and Omaha, Nebr., for the years 1875 and 1876.

Norman S. Bentley, New York City, furnished, May 3, 1877, with a statement showing the velocity of the wind at New York City March 8, 1877.

Charles Sharp, Norfolk, Va., furnished, May 3, 1877, with a statement of the velocity, direction, and pressure of the wind at Cape Hatteras, N. C., at 8 p. m. April 12, 1877.

Dr. William Gleitsman, Asheville, N. C., furnished, May 14, 1877, with a statement of the mean monthly and annual humidity for 1876 and part of 1877 at Augusta, Ga., Baltimore, Md., Boston, Mass., and Jacksonville, Fla.

Maj. G. Weitzel, Corps of Engineers, United States Army, Detroit, Mich., furnished, May 26, 1877, with a statement of the direction and velocity of the wind at Marquette, Mich., during the months of May, June, July, August, and September in the years 1871 and 1876, inclusive, and from May 1 to May 19, 1877, inclusive.

Hon. John S. Routt, governor of Colorado, Denver, Colo., furnished, May 28, 1877, with a statement showing the mean monthly humidity and number of days on which rain fell during each month in the years 1873, 1874, 1875, and 1876, at Denver, Colo., Portland, Oreg., and Saint Paul, Minn.

Messrs. W. B. Dana & Co., publishers Commercial and Financial Chronicle, New York City, furnished, June 4, 1877, with a statement showing amount of rain-fall and the number of days on which rain fell at Montgomery, Ala., from June, 1876, to May, 1877, inclusive; on June 8, 1877, with a record of the amount of rain-fall at Vicksburg, Miss., for each month from June, 1876, to May, 1877; on June 12, 1877, with statement of the amount of rain-fall at Memphis, Tenn., and Mobile, Ala., from June, 1876, to May, 1877, inclusive; and on June 20, 1877, with a statement of the monthly amount of rain-fall at Shreveport, La., from April, 1876, to May, 1877, inclusive.

M. K. Taylor, assistant surgeon, United States Army, San Antonio, Tex., furnished, June 16, 1877, with a statement showing the mean relative humidity at Jacksonville, Key West, Punta Rassa and Saint Mark's, Fla., and Galveston, Indianola and Corsicana, Tex., during the year 1876.

P. Connolly, Board of Trade, Chicago, Ill., furnished, June 16, 1877, with a statement showing the direction of the wind at Chicago, Ill., on the 20th, 21st, 22d, and 23d of March, and September, 1871, 1872, 1873, 1874, 1875, and 1876.

George H. Boynton, city engineer, Rock Island, Ill., furnished, June 27, 1877, with a statement of the monthly and greatest daily amounts of rain-fall at Davenport, Iowa, from June, 1871, to May, 1877, inclusive.

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List of publications received during the fiscal year ended June 30, 1877.

Observations météorologiques suédoises, publiées par l'Académie royal des sciences de Suède, exécutées et rédigées sous la direction de l'Institut central de météorologie. Vol. 15. 1873.

Supplemento alla meteorologia Italiana. Anno 1875, fascicolo 3 e 4. Anno 1876, fascicolo 1.

Monthly notices of Papers and Proceedings of the Royal Society of Tasmania for 1874.

Cartes synoptiques journalières. Construites par N. Hoffmeyer. Janvier à mai 1875.

Cartes synoptiques journalières. Trimestre supplémentaire. Construites par N. Hoffmeyer. Septembre, octobre, novembre 1873.

Annuaire météorologique pour l'année 1875. Publié par l'Institut météorologique danois. Première partie.

Meteorologische Beobachtungen an der K. K. Sternwarte in Wien von 1775 bis 1855. Erster bis fünfter Band. Wien, 1860–66.

Meteorologische Beobachtungen auf der Wiener Sternwarte in den Jahren 1856 bis 1874.

Meteorologische Beobachtungen angestellt auf der Universitäts-Sternwarte in Leipzig im Jahre 1875. Von Prof. Dr. C. Bruhns. Leipzig, 1876.

Undersøgelse af svartisen og temperaturforhold i enkelte af de Nordlandske fjorde. Idberetinung af det Akad. Kollegium om stipendireise 1873 af C. de Seue.

Histoire de l'atmosphère en avril, mai, juin, juillet et août 1876, par H. Tarry.

Meteorological observations taken at Orkney, with remarks on the climate, by the Rev. Charles Clouston. London, 1861.

Astronomische, magnetische und meteorologische Beobachtungen an der K. K. Sternwarte zu Prag im Jahre 1875. Von Carl Hornstein.

Association française pour l'avancement des sciences. (Congrès de Nantes.) M. Laisant.

Résumé des observations centralisées pendant l'année 1874–1875, par M. G. Lemoine, sous la direction de M. E. Belgrand. Versailles, 1875.

Observations sur les cours d'eau et la pluie centralisées pendant l'année 1874-75, par M. Belgrand et M. G. Lemoine.

Schriften des Vereines zur Verbreitung naturwissenschaftlicher Kenntnisse in Wien. Sechzehnter Band, Jahrgang 1875–76.

Symons's Monthly Meteorological Magazine. July, 1876, to June, 1877.

Nouvelles météorologiques. Septième année, 1874, deuxième partie, et juin à octobre et novembre à décembre 1876.

Sulla distribuzione della pioggia in Italia nell'anno meteorico 1871–72. Memoria del P. F. Denza. Roma, 1876.

La température et l'humidité de l'air à différentes hauteurs. Observées à Upsal pendant l'été de 1875. Par Dr. H. E. Hamberg.

(Official No. 28.) Contribution to the meteorology of Japan by Staff-Commander Thomas H. Tizard. Published by authority of the Meteorological Committee. London, 1876.

Hourly readings from the self-recording instruments at the seven observatories in connection with the Meteorological Office. London, November, December, 1875; January to December, 1876.

Observations made at the Magnetical and Meteorological Observatory at the Cape of Good Hope under the superintendence of Lieut. Col. Edward Sabine. Vol. 2, Meterological Observations, 1841 to 1846.

Report of the Meteorological Committee to the President and Council of the Royal Society on the work done in the Meteorological Office since their appointment in 1866, to December 31, 1875.

Reports on the meteorological and magnetic observations of Canada for the year ended 31st December, 1875.

Jahrbücher der K. K. Central-Anstalt für Meteorologie und Erdmagnetismus. Von Carl Jelinek und Ferdinand Osnaghi. Neue Folge, XI. Band, Jahrgang 1874.

Magnetische und meteorologische Beobachtungen zu Prag. Vom 1. August 1841 bis 31 December 1868.

Quarterly Journal of the Meteorological Society. Edited by a committee of the council. January, April, and July, 1876, and January, 1877.

Geological survey of Newfoundland. Report of progress for the year 1875.

Newfoundland Railway. Report of preliminary survey and explorations for 1875.

Académie d'Alger. (Départements d'Alger et d'Oran.) Bulletin de l'instruction No. 20, 1 septembre 1876.

Association française pour l'avancement des sciences. Congrès de Nantes. Service météorologique en Algérie. Par M. Laisant.

Die Witterungsverhältnisse des Jahres 1875. Nach den Beobachtungen der Württemb. meteorologischen Stationen zusammengestellt von Dr. H. Schoder. Stuttgart, 1876.
Windrosen des südlichen Norwegens, mit der Goldmedaille König Carls XV. belohnte Abhandlung. Von C. de Seue.
Report of the Meteorological Committee of the Royal Society for the year ending 31st December, 1875.
Zeitschrift der Oesterreichischen Gesellschaft für Meteorologie. Redigirt von C. Jelinek und J. Haun. X. Band. Wien, 1875.
Repertorium für Meteorologie. Herausgegeben von der Kaiserlichen Akademie der Wissenschaften. Redigirt von Dr. Heinrich Wild. Band IV, Hefte 1 und 2. Band V, Heft 1. St. Petersburg, 1875–76.
Annalen des physikalischen Centralobservatoriums. Herausgegeben von H. Wild. Jahrgang 1874 und 1875. St. Petersburg, 1876.
Stonyhurst College Observatory. Results of meteorological and magnetical observations. 1875.
Observations météorologiques publiées par la Société des sciences de Finlande. Année 1873. Helsingfors, 1875.
Öfversight af Finska vetenskaps-societetens forhandlingar XVII, 1874-75. Helsingfors, 1875.
Bidrag till kannedom af Finlands Natur och Folk. Utgifud af Finska vetenskaps-societeten. Helsingfors, 1875.
Jahresbericht des Mannheimer Vereins für Naturkunde. Erstattet in der General-Versammlung vom 19. Feb. 1870, am 4. April 1871 von Dr. E. Weber, 26. April 1872 bis 17. Juni 1874 von Director Prof. Vogelgesang. Manheim, 1870, 1871, 1872, 1876.
Acta Societatis Scientiarum Fennicae. Tomus X. Helsingfors, 1875.
Schweizerische meteorologische Beobachtungen. Jahrgänge 1874, 1875, 1876.
Observaciones meteorologicas efectuadas en rel Real Observatorio de Madrid. 1867–73. Madrid, 1868-74.
Resumen de las observaciones meteorologicas efectuadas en la peninsula 1867–73.
Annario del Observatorio de Madrid. 1860–76. Madrid, 1859–75.
Ministero di agricoltura, industria e commercia. Direzione di statistica meteorologia Italiana. Vol. 10, 1874. Roma, 1875.
Meteorologia Italiana. Bolletino decadico 1875. Roma, 1876.
Resultate der meteorologischen Beobachtungen an den selbst-registrirenden Instrumenten der Sternwarte zu Bern für das Jahr 1875. Von Prof. Dr. A. Forster. Bern, 1876.
Nouvelles études sur le climat de Genève par E. Plantamour. Genève, 1876.
Meteorological observations at stations of the second order. Compiled for the quarterly weather-reports. Published by direction of the Meteorological Committee of the Royal Society. London, 1876. Same for the year 1875. Part II. London, 1877.
Festrede zur Jahresfeier der Stiftung der Universität Dorpat am 12. December 1875: "Die gegenwärtigen Forschungen über den Ursprung des Krebses", gehalten von Ernst Bergmann. Dorpat, 1876.
Ad solemnia Caesarese Universitatis Dorpatensis quae quo die haec academia olim condita est die XII mensis Decembris anni 1875, hora XII, in aula magna oratione Ernesti Bergmanni. Dorpat, 1876.
Beobachtungen über das Leitbündel- und Grundgewebe aus vergleichend morphologischem und phylogenetischem Gesichtspunkt. Von Dr. Edmund Russon. Dorpat, 1875.
Einundsechzigster Jahresbericht der Naturforschenden Gesellschaft in Emden, 1875. Emden, 1876.
Das russische Geldwesen während der Finanzverwaltung des Grafen Cancrin von 1823 bis 1844, von Alfred Schmidt. St. Petersburg, 1875.
(Essai sur la cinématique céleste.) Astronomie géometrique, ou brèves considérations sur la nouvelle théorie des ovhélites par le Cte. Léopold Hugo. Paris, 1876.
L'aéronaute. Bulletin mensuel illustré de la navigation aérienne. Novembre 1876.
Résumé météorologique de l'année 1874 et 1875 pour Genève et le Grand Saint-Bernard, par E. Plantamour. Genève, 1875–76.
La nature. Hebdomadaire. Par Gustav Tissandier. 11 et 18 novembre 1876.
Ueber die Veränderlichkeit der Luftwärme in Norddeutschland nach gleichzeitigen 25jährigen Beobachtungen, von Dr. Gustav Hellman.
Proceedings of the Belfast Natural History and Philosophical Society for the session 1875–76.
Report of the Permanent Committee of the First International Congress at Vienna, meeting at London, 1876.
Results of meteorological observations made in New South Wales during 1873 under the direction of H. C. Russell. Sydney, 1875.
Mineral map and general statistics of New South Wales, Australia. Sydney, 1876.
New South Wales: its progress and resources. By authority of the commissioners. Sydney, 1876.

Transactions and Proceedings of the Royal Society of New South Wales for the year 1875. Vol. II. Edited by A. Liveridge. Sydney, 1876.
Mines and mineral statistics of New South Wales and notes on the geological collection of the department of mines. Compiled by direction of the Hon. John Lucas, M. P., minister of mines.
Transactions of the Philosophical Society of New South Wales. 1862–65. Sydney, 1866.
R. comitato geologico d'Italia. Bollettino No. 5 e 12, Maggio e Dicembre, 1875.
Schweizerische meteorologische Beobachtungen. Eilfter Jahrgang, 1874, Titel und Beilagen zum eilften Jahrgang, 1874, und dreizehnter Jahrgang, 1876, zweite Lieferung.
Bolletino mensile dello Osservatorio Meteorico e Magnetico in Pesaro, Serie II, Vol. I.
Instruktion für die Signalstellen der deutschen Seewarte. Hamburg, 1876.
(Separat-Abdruck aus "Hamburg in naturhistorischer und medicinischer Beziehung".) II. Einiges über die physikalischen Verhältnisse von Hamburg und Umgebung.
Deutsche Seewarte. Monatliche Übersicht der Witterung. Januar bis August 1876, und Januar bis April 1877.
Journal of the Scottish Meteorological Society, for the quarter ending March, 1876. Vol. V. Nos. 49 and 50.
Die Strömungen im Nord-Atlantischen Ocean, mit besonderer Rücksicht des Golfstromes. Studie von Dr. Konrad Jarz. Wien, 1877.
Annuaire de l'Observatoire de Montsouris pour l'an 1877.
Annuaire météorologique pour l'année 1875, publié par l'Institut météorologique danois. Deuxième partie.
Ueber Normalbarometer und ihre Vergleichung. Von H. Wild. November, 1876.
Annuaire pour l'an 1877, publié par le bureau des longitudes, Paris.
Observations météorologiques suédoises, publiées par l'Académie royale des sciences de Suède. Vol. 16, 2me série, Vol. 2, 1874.
Oversight over Veirforholdene i Norge i Aaret 1875. Udgivet af det Norske Meteorologiske Institut.
Instructions for keeping the meteorological log.
Report of the Treasury committee appointed to inquire into the conditions and mode of administration of the annual grant in aid of meteorological observations, together with minutes of evidence, appendix, and index. London, 1877.
Instructions to agents for the publication of storm-warnings, issued from the Meteorological Office, Toronto, to come into use 1st January, 1876. Toronto, 1875.
Daily Weather Reports of Meteorological Office, London, 1st July, 1875, to 31st December, 1876.
Manads och Årsmedia af temperaturen på statens meteorologisca stationer under åren 1859–1872 af Robert Rubensen. Stockholm, 1876.
Supplemento alla Meteorologia Italiana anno 1876, fascicolo II e III. Roma, 1877.
Über den gegenwärtigen Zustand der Anemometrie und über Anemometerverification. Von H. Wild.
Photometrische Bestimmung des diffusen Himmelslichtes. (Erste Fortsetzung.) Von H. Wild.
The aneroid barometer, how to buy and how to use it with the new altitude tables by the Astronomer Royal. By a Fellow of the Meteorological Society. London, 1874.
Report of the Meteorological Department of the Board of Trade, 1858. London, 1858.
Results of astronomical observations. Cape of Good Hope, 1871–73.
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PAPER 9.

Showing stations inspected, by whom, and when inspected, during the fiscal year ending June 30, 1877.

Stations.	Name of inspector.	Date.
Albany, N. Y	First Lieut. James A. Buchanan, acting signal-officer	Dec. 12–14, 1876.
	do	June 10–13, 1877.
Alpena, Mich	Second Lieut. James Allen, acting signal-officer	Aug. 30, 31, 1876.
Atlantic City, N. J	First Lieut. James A. Buchanan, acting signal-officer	Mar. 11–14, 1877.
Augusta, Ga	Second Lieut. James Allen, acting signal-officer	June 25–28, 1877.
Baltimore, Md	First Lieut. James A. Buchanan, acting signal-officer	Nov. 25–27, 1876.
Bangor, Me	Second Lieut. James Allen, acting signal-officer	July 22–24, 1876.
Barnegat, N. J	do	Nov. 14, 1876.
	First Lieut. James A. Buchanan, acting signal-officer	Mar. 18–31, 1877.
Bismarck, Dak	Second Lieut. James Allen, acting signal-officer	Sept. 30–Oct. 4, 1876.
Boerne, Tex	First Lieut. A. W. Greely, acting signal-officer	Apr. 18, 19, 1877.
Boston, Mass	Second Lieut. James Allen, acting signal-officer	Aug. 5–8, 1876.
	First Lieut. James A. Buchanan, acting signal-officer	May 14–19, 1877.
Brackettville, Tex	First Lieut. A. W. Greely, acting signal-officer	May 26–29, 1877.
Breckenridge, Minn	Second Lieut. James Allen, acting signal-officer	Sept. 17, 18, 1876.
Brownsville, Tex	First Lieut. A. W. Greely, acting signal-officer	June 22–27, 1877.
Buffalo, N. Y	First Lieut. James A. Buchanan, acting signal-officer	Dec. 31, '76–Jan. 5, '77.
	do	June 27–30, 1877.
Burlington, Vt	Second Lieut. James Allen, acting signal-officer	July 11–14, 1876.
	First Lieut. James A. Buchanan, acting signal-officer	June 3–5, 1877.
Cairo, Ill	do	Sept. 20, 21, 1876.
	Second Lieut. James Allen, acting signal-officer	Mar. 19–23, 1877.
Cambridge, Tex	First Lieut. A. W. Greely, acting signal-officer	Feb. 21, 22, 1877.
Cape May, N. J	First Lieut. James A. Buchanan, acting signal-officer	Mar. 8–10, 1877.

Showing stations inspected, by whom, and when inspected, &c.—Continued.

Stations.	Name of inspector.	Date.
Castroville, Tex	First Lieut. A. W. Greely, acting signal-officer	May 22, 23, 1877.
Charleston, S. C	Second Lieut. James Allen, acting signal-officer	June 21–24, 1877.
Cheyenne, Wyo	do	Dec. 4–7, 1876.
Chicago, Ill	First Lieut. James A. Buchanan, acting signal-officer	Oct. 22–25, 1876.
Cincinnati, Ohio	do	Feb. 5–8, 1877.
Cleveland, Ohio	do	Oct. 29, 30, 1876.
Coleman City, Tex	First Lieut. A. W. Greely, acting signal-officer	May 9–11, 1877.
Concho, Tex	do	Apr. 30–May 6–8, '77.
Corsicana, Tex	Second Lieut. James Allen, acting signal-officer	May 5, 6, 1877.
Davenport, Iowa	First Lieut. James A. Buchanan, acting signal-officer	Oct. 2–6, 1876.
Decatur, Tex	First Lieut. A. W. Greely, acting signal-officer	Mar. 7, 8, 1877.
Denver, Colo	Second Lieut. James Allen, acting signal-officer	Dec. 8–12, 1876.
Denison, Tex	First Lieut. A. W. Greely, acting signal-officer	Mar. 13–21, 1877.
Detroit, Mich	First Lieut. James A. Buchanan, acting signal-officer	Jan. 13–20, 1877.
Dodge City, Kans	Second Lieut. James Allen, acting signal-officer	Mar. 1–3, 1877.
Dubuque, Iowa	First Lieut. James A. Buchanan, acting signal-officer	Oct. 7–11, 1876.
Duluth, Minn	Second Lieut. James Allen, acting signal-officer	Sept. 13, 14, 1876.
Eagle Pass, Tex	First Lieut. A. W. Greely, acting signal-officer	May 30–June 1, 1877.
Eastport, Me	Second Lieut. James Allen, acting signal-officer	July 26–31, 1876.
	First Lieut. James A. Buchanan, acting signal-officer	May 25–28, 1877.
Edinburg, Tex	First Lieut. A. W. Greely, acting signal-officer	June 21–24, 1877.
Erie, Pa	First Lieut. James A. Buchanan, acting signal-officer	Jan. 6–9, 1877.
Escanaba, Mich	Second Lieut. James Allen, acting signal-officer	Sept. 8–10, 1876.
Fort Gibson, Ind. T	First Lieut. James A. Buchanan, acting signal-officer	Sept. 11–15, 1876.
	Second Lieut. James Allen, acting signal-officer	Mar. 6–10, 1877.
Fort Sully, Dak	do	Oct. 10, 11, 1876.
Fort Sill, Ind. T	First Lieut. A. W. Greely, acting signal-officer	Feb. 17–19, 1877.
Fredericksburg, Tex	do	Apr. 19–21, 1877.
Galveston, Tex	Second Lieut. James Allen, acting signal-officer	May 7–10, 1877.
Graham, Tex	First Lieut. A. W. Greely, acting signal-officer	Feb. 27, 28, 1877.
Grand Haven, Mich	First Lieut. James A. Buchanan, acting signal-officer	Jan. 24–26, 1877.
Griffin, Tex	First Lieut. A. W. Greely, acting signal-officer	Mar. 1–4, 1877.
Henrietta, Tex	do	Feb. 21, 22, 1877.
Indianapolis, Ind	First Lieut. James A. Buchanan, acting signal-officer	Jan. 30–Feb. 1, 1877.
Indianola, Tex	Second Lieut. James Allen, acting signal-officer	May 13, 1877.
Jacksboro', Tex	First Lieut. A. W. Greely, acting signal-officer	Feb. 24–26, Mar. 5, '77
Jacksonville, Fla	Second Lieut. James Allen, acting signal-officer	June 11–14, 1877.
Keokuk, Iowa	First Lieut. James A. Buchanan, acting signal-officer	Sept. 27–Oct. 1, 1876.
Key West, Fla	Second Lieut. James Allen, acting signal-officer	May 20, 21, 26–28, '77.
La Crosse, Wis	First Lieut. James A. Buchanan, acting signal-officer	Oct. 12–15, 1876.
Laredo, Tex	First Lieut. A. W. Greely, acting signal-officer	June 6–8, 1877.
Leavenworth, Kans	Second Lieut. James Allen, acting signal-officer	Oct. 23–25, 1876.
Logansport, Ind	First Lieut. James A. Buchanan, acting signal-officer	Jan. 28, 29, 1877.
Louisville, Ky	do	Feb. 2–4, 1877.
Lynchburg, Va	do	Feb. 26–28, 1877.
Malone, N. Y	Second Lieut. James Allen, acting signal-officer	July 7–10, 1876.
Marquette, Mich	do	Sept. 10, 11, 1876.
Mason, Tex	First Lieut. A. W. Greely, acting signal-officer	Apr. 23–25, 1877.
McKavett, Tex	do	Apr. 26–29, 1877.
Memphis, Tenn	First Lieut. James A. Buchanan, acting signal-officer	July 18–25, 1876.
	Second Lieut. James Allen, acting signal-officer	Mar. 25–29, 1877.
Milwaukee, Wis	First Lieut. James A. Buchanan, acting signal-officer	Oct. 22–25, 1876.
Mobile, Ala	Second Lieut. James Allen, acting signal-officer	Apr. 10–14, 1877.
Montgomery, Ala	do	Apr. 7–10, 1877.
Mogantown, W. Va	First Lieut. James A. Buchanan, acting signal-officer	Feb. 14, 15, 1877.
Mt. Washington, N. H	Second Lieut. James Allen, acting signal-officer	July 15–17, 1876.
	First Lieut. James A. Buchanan, acting signal-officer	May 30–June 1, 1877.
Nashville, Tenn	do	Sept. 16–18, 1876.
New Haven, Conn	do	Aug. 16–19, 1876.
	do	May 4–8, 1877.
New London, Conn	Second Lieut. James Allen, acting signal-officer	Aug. 14–16, 1876.
	First Lieut. James A. Buchanan, acting signal-officer	May 9–11, 1877.
New Orleans, La	Second Lieut. James Allen, acting signal-officer	Apr. 16–21, 1877.
Newport, R. I	do	Aug. 9, 10, 1876.
	First Lieut. James A. Buchanan, acting signal-officer	June 6–8, 1877.
New York City	do	Dec. 4–10, 1876.
	do	Apr. 25–May 3, 18
Norfolk, Va	do	Mar. 2–5, 1877.
North Platte, Nebr	Second Lieut. James Allen, acting signal-officer	Dec. 1–3, 1876.
Omaha, Nebr	do	Oct. 19–22, 1876.
Oswego, N. Y	First Lieut. James A. Buchanan, acting signal-officer	Dec. 23, 1876.
	do	June 15–20, 1877.
Pembina, Dak	Second Lieut. James Allen, acting signal-officer	Sept. 23–27, 1876.
Philadelphia, Pa	First Lieut. James A. Buchanan, acting signal-officer	Dec. 1–3, 1876.
Pike's Peak and Colorado Springs, Colo.	Second Lieut. James Allen, acting signal-officer	Dec. 13–17, 1876.
Pilot Point, Tex	First Lieut. A. W. Greely, acting signal-officer	Mar. 9–10, 1877.
Pittsburgh, Pa	First Lieut. James A. Buchanan, acting signal-officer	Feb. 9–12, 1877.
Port Huron, Mich	do	Jan. 21–23, 1877.
Portland, Me	Second Lieut. James Allen, acting signal-officer	July 18–21, 1876.
	First Lieut. James A. Buchanan, acting signal-officer	May 20–23, 1877.

Showing stations inspected, by whom, and when inspected, &c.—Continued.

Stations.	Name of inspector.	Date.
Portland, Oreg	Second Lieut. James Allen, acting signal-officer	Jan. 10–12, 1877.
Punta Rassa, Fla	do	May 22–23, 1877.
Rio Grande City, Tex	First Lieut. A. W. Greely, acting signal-officer	June 13–20, 1877.
Rochester, N. Y	First Lieut. James A. Buchanan, acting signal-officer	Dec. 27–30, 1876.
	do	June 23–26, 1877.
Saint Mark's, Fla	Second Lieut. James Allen, acting signal-officer	June 7–9, 1877.
Saint Louis, Mo	do	Oct. 26–28, 1876.
	do	Mar. 13–17, 1877.
Saint Paul, Minn	First Lieut. James A. Buchanan, acting signal-officer	Oct. 21, 1876.
Salt Lake City, Utah	Second Lieut. James Allen, acting signal-officer	Dec. 22–26, 1876.
San Antonio, Tex	First Lieut. A. W. Greely, acting signal-officer	Mar. 28–Apr. 13, 1877.
San Diego, Cal	Second Lieut. James Allen, acting signal-officer	Jan. 24–29, 1877.
San Francisco, Cal	do	Dec. 29, '76–Jan. 4, '77.
Sandy Hook, N. J	First Lieut. James A. Buchanan, acting signal-officer	Apr. 21–24, 1877.
Savannah, Ga	Second Lieut. James Allen, acting signal-officer	June 16–19, 1877.
Shreveport, La	First Lieut. James A. Buchanan, acting signal-officer	July 4–7, 1876.
	Second Lieut. James Allen, acting signal-officer	May 2–4, 1877.
Stockton, Tex	First Lieut. A. W. Greely, acting signal-officer	May 3, 4, 1877.
Thatcher's Island, Mass	Second Lieut. James Allen, acting signal-officer	Aug. 1–4, 1876.
Toledo, Ohio	First Lieut. James A. Buchanan, acting signal-officer	Jan 10–12, 1877.
Tybee Island, Ga	Second Lieut. James Allen, acting signal-officer	Jan. 19–21, 1877.
Uvalde, Tex	First Lieut. A. W. Greely, acting signal-officer	May 24, 25, 1877.
Virginia City, Mont	Second Lieut. James Allen, acting signal-officer	Feb. 16–18, 1877.
Vicksburgh, Miss	do	Mar. 30–Apr. 4, 1877.
Wilmington, N. C	do	June 29–July 2, 1877.
Wood's Holl, Mass	do	Aug. 10–13, 1876.
	First Lieut. James A. Buchanan, acting signal-officer	May 12–14, 1877.
Yankton, Dak	Second Lieut. James Allen, acting signal-officer	Oct. 15–18, 1876.

PAPER 10.

List of places for which stations have been requested, but not established, on June 30, 1877.

Place.	Applicant.	Date.
Muskegon, Mich	Hon. H. H. Holt, Michigan legislature, inclosing petition of 99 citizens.	Jan. 21, 1871
	Board of Trade of Toledo	Jan. 27, 1871
	Board of Trade of Chicago	Feb. 10, 1871
	Hon. T. W. Ferry, United States Senate	Mar. 3, 1871
	Hon. T. W. Ferry, M. C.; S. H. Wagener, mayor, and 43 others.	Mar. 15, 1875
Manitowoc, Wis	Hon. P. Sawyer, M. C	Jan. 25, 1871
	Hosea Barnes	May 4, 1876
Huron City, Mich	Board of Trade of Toledo	Jan. 27, 1871
	Board of Trade of Cleveland	Jan. 19, 1871
	Board of Trade of Detroit	Feb. 19, 1871
Mackinac City, Mich	Board of Trade of Chicago	Feb. 10, 1871
Richmond, Va	W. G. Turpin	Apr. 3, 1871
Body Island, N. C	Board of Trade of Norfolk, Va., and resolution of the general assembly of Virginia.	Apr. 17, 1871
Lewes, Del	Board of Trade of Philadelphia	May 25, 1871
The Parks of Colorado	E. J. Mallett, late consul-general	May 24, 1871
Staten Island	C. Kentgen, jr	June 9, 1871
	do	June 20, 1871
Chambersburg, Pa	Hon. John Scott, United States Senate	June 12, 1871
	Hon. Simon Cameron, United States Senate	June 12, 1871
Watertown, N. Y	L. L. Pratt	June 21, 1871
	Common council, forwarded by Mayor Fred. D. Hills	June 21, 1873 Mar. 9, 1876
Xenia, Ohio	C. E. Case	June 30, 1871
Port Hope	Board of Trade, Detroit	July 22, 1871
Champaign, Ill. (Illinois Industrial University).	Hon. W. C. Flagg, secretary	July 21, 1871
	Hon. J. M. Gregory, president	Feb. 21, 1872
	E. A. Gastman, chairman meteorological committee Macon County Fruit-Growers' Association.	Aug. 30, 1874
Little Rock, Ark	Hon. J. M. Hanks, M. C	July 26, 1871
	Albert Cohen	July 1, 1872
	A. Van Cleff	May 31, 1873
	Hon. Powell Clayton, United States Senate	Mar. 11, 1874
	Hon. Powell Clayton, United States Senate; Hon. S. W. Dorsey, United States Senate; Hon. W. S. Slemons, M. C.; Hon. L. C. Ganse, M. C.; Hon. T. M. Gunter, M. C.; Hon. W. W. Wilshire, M. C.	Feb. 7, 1876
Niles, Mich	J. B. Fitzgerald, secretary Berrien County Agricultural Society.	July 27, 1871

List of places for which stations have been requested, &c.—Continued.

Place.	Applicant.	Date.
Louisiana, Mo	W. Stark and R. E. Pleasants	Aug. 3, 1871
Hot Springs, Ark	J. H. Morton, M. D	Aug. 2, 1871
Janesville, Wis	J. B. Whiting, M. D., and Rock County Agricultural Society.	Aug. 7, 1871
Hillsdale, Mich	Prof. George McMillan, secretary Hillsdale College	Aug. 6, 1871
	Hillsdale County Agricultural Society	Aug. 6, 1871
Metamora, Ill	Edward Kipp, secretary Woodford County Agricultural Society.	Aug. 8, 1871
Marietta, Ohio	J. W. Andrews, president Marietta College; Washington County Agricultural Society.	Aug. 10, 1871
Mount Pleasant, Pa. (Mount Pleasant Academy).	W. H. McCreery, acting principal	Aug. 11, 1871
Nebraska City, Nebr	H. K. Raymond, secretary Otoe County Farmers' Club	Aug. 14, 1871
Peoria, Ill	L. J. Colton	Aug. 11, 1871
	W. H. Herron, J. C. Proctor, and 80 others	Mar. 7, 1876
Princeton, Ill	L. J. Colton	Aug. 11, 1871
Mount Moosilauk, N. H	Prof. C. H. Hitchcock	Aug. 16, 1871
	A. F. Clough	Aug. 16, 1871
Catasauqua, Pa	Hon. E. McPherson, Clerk United States House of Representatives.	Sept. 11, 1871
Galena, Ill	D. Wilmot Scott, publisher of the Galena Commercial Advertiser.	Sept. 14, 1871
Columbus, Nebr	J. O. Shannon, secretary Platte County Agricultural Society.	Sept. 5, 1871
Coburg and Collingwood, Canada.	Oswego Board of Trade, by J. L. McWhorter	Aug. 30, 1871
Springfield, Mo	John E. Worth, for Greene County Agricultural and Mechanical Society.	Sept. 18, 1871
	A. Milton Lapham	Apr. 6, 1877
Mason City, Iowa	T. G. Emsley, secretary Cerro Gordo County Agricultural Society.	Oct. 6, 1871
Orono, Me. (State Agricultural College).	M. C. Fernald, Maine State College of Agriculture	Oct. 19, 1871
Balize, La. Fort Morgan, Ala., and Waco, Tex.	L. Libbey, postmaster	Feb. 17, 1873
	Agents and captains of Morgan Steamship Company	Oct. 31, 1871
Fort Randall, Dak	R. J. Percy, for Missouri Valley Telegraph Company	Nov. 9, 1871
Ann Harbor, Mich. (University of Michigan).	Prof. G. B. Merriman	Nov. 28, 1871
Fountain, Colo	R. F. Long, editor El Paso Ranchman	Dec. 4, 1871
Vineyard Haven, Mass	Prof. J. E. Hilgard, United States Coast Survey; Daniel W. Stevens, and Rev. Thomas Hill.	Dec. 18, 1871
Cape Ann, Mass	Hon. B. F. Butler, M. C	Dec. 19, 1871
Iowa City, Iowa (State University).	John P. Irish	Dec. 14, 1871
	S. J. Kirkwood	Jan. 6, 1873
	A. D. Schenck, first lieutenant, Second United States Artillery.	July 3, 1875
Manassas, Va	George C. Round	Dec. 27, 1871
Quincy, Ill	A. H. Hill, secretary National Board of Trade	Jan. 4, 1872
Dover Point, N. H	John B. Stivens, mayor	Jan. 13, 1872
Wilmington, Del	Board of Trade of Wilmington	Jan. 24, 1872
Additional stations on eastern shore of Lake Michigan.	Hon. H. H. Holt of Michigan legislature	Feb. 11, 1871
Additional stations on mountains of Virginia.	G. C. Wedderburn, secretary of Virginia Telegraph Company; L. A. Gobright, Associated Press.	May 17, 1871
Additional stations on western slope of Mississippi Valley.	George P. Plant, W. H. Scudder, and R. P. Handy, committee of Merchants' Exchange, Saint Louis.	July 16, 1871
Monomdy Point, Cape Cod Light, Mass.	R. B. Forbes	Nov. 29. 1871
Southwest Pass (Pass à l'Outre), La.	Thornton A. Jenkins, rear-admiral, United States Navy	Mar. 20, 1871
Staunton, Va., Christianburg, Va., Bristol, Tenn., Easton, Pa., Harrisburg, Pa., Winchester, Va.	Jed. Hotchkiss, secretary of the Augusta County Fair, Virginia.	Aug. 15, 1871
Towanda, Kans	M. D. Ellis	Feb. 12, 1872
Black Dome, N. C. (Black Mountain).	William Cain	Feb. 12, 1872
Charlotte, N. Y	J. Eaton and 35 others	Feb. 14, 1872
	G. G. Clarkson, mayor, and 15 others	Oct. 27, 1874
	W. H. Newcomb and 22 others	Oct. 27, 1874
Gallitzin and Altoona, on Pennsylvania Central Railroad.	David Peelor	Feb. 17, 1872
Minneapolis, Minn. (University of Minnesota).	William W. Folwell, president	Feb. 21, 1872
Each of the State Agricultural Colleges.	J. B. Bowman, regent of Kentucky University, and others	Feb. 29, 1872
Columbus, Ohio	J. H. Klippart, secretary Ohio State Board of Agriculture.	Mar. 5, 1872
	William McCrary	Jan. 4, 1876

List of places for which stations have been requested, &c.—Continued.

Place.	Applicant.	Date.
Columbus, Ohio	Legislature of Ohio, by joint resolution; Tyndall Association of Columbus; Columbus Academy of Medicine, and Board of Education, Columbus.	Feb. 8, 1876
	R. B. Hayes, President of United States; Tyndall Association of Columbus, by A. H. Tuttle, A. G. Farr, and C. C. Howard.	June 22, 1877
Northfield, Vt. (Norwich University).	Capt. C. A. Curtis	Mar. 15, 1872
Grand Tower, Ill	A. R. Harris, secretary Mutual Aid and Improvement Society of Saint Louis, Mo.	Mar. 21, 1872
Iuka, Miss	Rev. J. T. Freeman (through Hon. George E. Harris, M. C.).	Mar. 25, 1872
Great Natihalee, (Bald Mountain), N. C.	Charles W. Jenks	Apr. 1, 1872
Deposit, N. Y	G. W. Hanford	Apr. 1, 1872
Hellman Dale, Pa	S. P. Heilman	Apr. 1, 1872
Boonville, Mo	J. L. Stephens	Apr. 11, 1872
Fort Wayne and New Albany, Ind.	F. C. Johnson, chairman meteorological committee Indiana State Board of Agriculture.	Apr. 12, 1872
Maryland Agricultural College.	A. R. Davis, president of board of trustees	Apr. 19, 1872
	do	June 21, 1872
Atlanta, Ga	Hon. John H. James, mayor; Chamber of Commerce	May 10, 1872
	Hon. R. A. Whiteley, M. C	Feb. 15, 1874
	Hon. Milton Candler, M. C.; P. H. Mell, jr., State chemist	Jan. 16, 1877
	P. H. Mell, jr., State chemist	Jan. 22, 1877
	Hon. A. H. Stephens, M. C.; Hon. Thomas P. Jones, agricultural commissioner of Georgia; George Little, State geologist, and 4 others.	Feb. 8, 1877
	Hon. J. B. Gordon, United States Senator	Feb. 23, 1877
Auburn, Ala. (Agricultural and Mechanical College of Alabama).	William C. Stubbs, John B. Read, and W. H. Jennison	May 14, 1872
Racine, Wis	Mayor and council	May 18, 1872
Ogdensburg, N. Y	Hon. W. A. Wheeler, M. C	May 25, 1872
Plattsburg, N. Y	Hon. John Rogers, M. C	May 28, 1872
Sewanee, Tenn	John L. Cooper (through Prof. Joseph Henry, Smithsonian Institution).	June 10, 1872
(University of the South)	Hon. W. C. Whitthorne; Right Rev. Alex. Gregg, bishop of Texas; faculty of college, and others.	June 26, 1877
Newark, Del. (Delaware College).	Willam D. Mackey, secretary of faculty	June 11, 1872
Green Bay, Wis	Hon. P. Sawyer, M. C	June 13, 1872
	do	June 24, 1874
Kenosha, Wis	Wallace Mygatt	June 20, 1872
Warsaw, Ind	Marshall H. Parks	June 24, 1872
Beaver City, Utah	Daniel Tyler	July 8, 1872
New Ulm, Minn	Dr. Alfred Muller	July 10, 1872
Evansville, Ind	F. C. Johnson; P. Hornbrook, surveyor of customs; Thomas P. Britton, president Vanderburg County Agricultural Society; John Ingle, secretary Vanderburg County Agricultural Society, and Charles H. Butterfield, mayor.	July 13, 1872
	C. H. Butterfield, mayor	Nov. 26, 1873
	H. L. Morrill and citizens of Evansville	Jan. 16, 1874
	T. W. Veneman	May 31, 1875
Aiken, S. C	Hon. F. A. Sawyer, United States Senate, and 16 citizens.	July 16, 1872
	John C. Derby	Sept. 2, 1872
	James Whitall	Mar. 31, 1875
Winona, Miss	A. M. Rafter	July 20, 1872
Eutaw, Ala	W. S. Bird	July 20, 1872
Belfast, Me	George E. Brackett	Aug. 6, 1872
Ithaca, N. Y. (Cornell University).	A. D. White, president, and petition of 75 citizens	Aug. 8, 1872
	Farmers' Club of Ithaca	Nov. 18, 1872
	A. D. White, president, and faculty of Cornell University.	Nov. 22, 1872
	Hon. Roscoe Conkling, United States Senate	Jan. 25, 1873
	P. B. Crandell, corresponding secretary of Farmers' Club.	Feb. 3, 1875
	E. A. Fuertes, department of engineering	Mar. 17, 1875
Straits of Mackinac	Roys I. Cram	Aug. 7, 1872
	Chamber of Commerce, Milwaukee	May 5, 1873
	Board of Trade, Buffalo	May 26, 1873
	Board of Trade, Chicago	May 22, 1873
	J. L. Hathaway and J. B. Merrill, meteorological committee Chamber of Commerce, Milwaukee.	Sept. 5, 1874
Carthage, Ill	L. F. M. Easterday and petition of 105 citizens	Sept. 2, 1872
Kutztown, Pa. (Keystone State Normal School).	A. R. Horne, principal	Sept. 13, 1872
Pensacola, Fla	S. C. Cobb, president Pensacola Ice Company, and 128 others.	Oct. 7, 1872
	Thomas C. Watson, commodore of Pensacola Regatta Club.	July 25, 1873
Gainesville, Ga	M. F. Stephenson	Nov. 5, 1872

List of places for which stations have been requested, &c.—Continued.

Place.	Applicant.	Date.
Chattanooga, Tenn	Steamboatmen's convention assembled at Cairo, Ill	Nov. 17, 1872
	J. M. Pettigrew, president, and J. S. Toof, secretary, Memphis Chamber of Commerce, and 101 others.	Aug. 15, 1875
Some point between Leavenworth and Shreveport.	Steamboatmen's convention assembled at Cairo, Ill	Nov. 17, 1872
On plains of Western Kansas, and regions southward and southwestward.	Kansas State Horticultural Society	Dec. 21, 1872
Dallas, Tex	W. A. Jones & Co., W. C. Connor, and 133 others	Dec. 26, 1872
Oil City and Parker's Landing on the Allegheny River.	Resolution of select council of Pittsburgh, transmitting and approving petition of 46 citizens of Pittsburgh.	Dec. 28, 1872 Jan. 16, 1873
Greensborough and Brownsville on the Monongahela.		
Lawrence, Kans. (University of Kansas).	John Fraser, chancellor; Hon. Stephen A. Cobb, M. C., inclosing petition of Alfred Gray, secretary State Board of Agriculture.	Jan. 16, 1873 May 6, 1873
Manchester, N. H	Hon. S. N. Bell, M. C., inclosing resolution of New Hampshire State Agricultural Society.	Jan. 21, 1873
Sandwich, Ill	N. E. Ballon (through Commissioner of Agriculture)	Jan. 22, 1873
Detroit, Minn	Daniel Cony	Feb. 2, 1873
Dayton, Ohio (National Soldiers' Home).	Hon. Isaac Strohen	Feb. 11, 1873
	Thomas L. Neal, president, and Thomas D. Davis, secretary, Montgomery County Medical Society.	Feb. 1, 1875
Palatka, Fla	J. F. Starr (through Secretary of the Navy)	Feb. 17, 1873
Put in Bay, Ohio	H. B. West	Mar. 3, 1873
	H. D. Cooke, governor District of Columbia	July 17, 1873
Emporia, Kans	Robert Milliken	Mar. 6, 1873
North and west of Galveston, Tex.	Chamber of Commerce (through Hon. John Hancock)	Mar. 6, 1873
Charlottesville, Va. (University of Virginia).	Hon. R. T. W. Duke, M. C	Mar. 2, 1873
Raleigh, N. C	Cotton Exchange, New Orleans	Mar. 30, 1873
Columbia, S. C	do	Mar. 30, 1873
	Hon. John Alexander, mayor, transmitting resolution of city council.	June 11, 1873
	Hon. F. A. Sawyer, and petition of 58 citizens, and resolution of city council.	Aug. 5, 1873
Columbus, Miss	Cotton Exchange, New Orleans, La	Mar. 30, 1873
Pierce City, Mo	E. P. Lingee, president board of education	Apr. 9, 1873
Neshanic Mountain, Somerset County, N. J.	John V. D. Pumyea	Apr. 12, 1873
Bay City, Mich	Hon. N. B. Bradley, M. C	Apr. 27, 1873
	do	Feb. 19, 1874
	do	June 17, 1874
	W. S. Crosthwaite	Jan. 21, 1875
Vincennes, Ind	W. Hays	June 15, 1873
Springfield, Ill	S. M. Cullom, transmitting petition of governor, State officers, and others.	July 5, 1873
	E. A. Gastman, chairman meteorological committee Macon County Fruit-Growers' Association.	Aug. 30, 1874
Cedar Keys, Fla	Hon. Albert E. Willard, mayor, and 16 others	July 7, 1873
	D. L. Yulee, Fernandina, Fla	Feb. 7, 1874
Salina, Kans	Freeman Kingman, secretary Patrons of Husbandry and Farmers' Club.	July 17, 1873
	Hon. W. A. Phillips, M. C	Apr. 2, 1877
Alleghanies in North Carolina	George W. Warren, jr	July 26, 1873
Carthage, Mo	E. P. Searle and 174 others	Aug. 15, 1873
New Berne, N. C	G. W. Nason, jr	Sept. 13, 1873
Port Townsend, Wash	J. W. Sweeny, general superintendent Puget Sound Telegraph Company.	Sept. 30, 1873
Mineral Point, Wis	Hon. T. O. Howe, United States Senate; Moses M. Strong	Dec. 16, 1873
Latitude 40° 30', longitude 74° 42', Somerset County, N. J.	Hon. F. T. Frelinghuysen, United States Senate; citizens of Somerset, Hunterdon, and Middlesex Counties.	Dec. 22, 1873
Carlton, Wis	Edward Bach, farmers and ship-owners of the district	Jan. 10, 1874
	Hon. Philetus Sawyer, M. C.; Edward Bach	Jan. 26, 1874
Fernandina, Fla	Henry Hazen, collector; W. S. Simmons, first lieutenant United States Revenue Marine.	Jan. 17, 1874
	Hon. S. B. Conover, United States Senate; G. Stark, mayor; Isaiah Winch, president of council, and 23 others.	Jan. 19, 1874
	D. L. Yulee	Feb. 7, 1874
Helena, Ark	Hon. J. L. Alcorn, United States Senate	Feb. 12, 1874
Oakland, Cal. (University of California).	J. West Martin, secretary of the board of regents	Feb. 12, 1874
Fayetteville, Ark. (Arkansas Industrial University).	Hon. A. S. Prather, trustee	Feb. 17, 1874
Beatrice, Nebr	Hon. P. W. Hitchcock, United States Senate; A. S. Paddock.	Mar. 3, 1874
One or more stations in Arizona.	Charles Dennison, M. D	Mar. 16, 1874

List of places for which stations have been requested, &c.—Continued.

Place.	Applicant.	Date.
Manistee, Mich	Hon. J. A. Hubbell, M. C.; L. T. Estis	Mar. 18, 1874
Fort Macon, N. C	Hon. J. M. Leach, M. C	Mar. 28, 1874
Gorham, N. H	Elias S. Mason	Mar. 30, 1874
Mason City, Mo	J. F. Benjamin, Brown & Sheppard, E. B. Van Vent, and 33 others.	Mar. 30, 1874
Rockland, Me	Citizens of Rockland, Belfast, &c	Apr. 9, 1874
	E. Waite, and 27 others	Apr. 16, 1874
Rome, Ga	Thomas J. Perry, chairman meteorological committee Rome Agricultural, Horticultural, and Mechanical Fair Association.	Apr. 24, 1874
	Thomas J. Perry, secretary meteorological committee Rome Agricultural, Horticultural, and Mechanical Fair Association.	Jan. 1, 1875
	do	Dec. 4, 1875
	Hon. William H. Felton, M. C	May 31, 1876
	Henry A. Hills, secretary Chamber of Commerce, Rome, Ga.	Mar. 16, 1877
Kansas City, Mo	Thomas S. Case, postmaster	May 1, 1874
Muscatine, Iowa	J. P. Walton	May 7, 1874
Syracuse, N. Y	N. Graves, mayor; William Kirpatrick, J. R. Whittock, and J. Hill.	May 9, 1874
	Hon. R. H. Duell, M. C	May 11, 1874
Bakersfield, Cal	A. C. Bratton, M. D.; P. D. McClanohon, M. D	May 14, 1874
Palmyra, Wis	John C. Minton	May 19, 1874
Crawfordsville, Ind. (Wabash College).	Col. H. B. Carrington, United States Army, chairman military science Wabash College.	June 6, 1874
Harbor of Refuge, Sand Beach, Lake Huron.	Maj. G. Weitzel, Corps of Engineers	June 11, 1874
Calais, Me	Hon. Eugene Hale, M. C.; Boardman Bros	June 16, 1874
Fort Thompson, Dak	Col. D. S. Stanley	June 18, 1874
Chatawa, Miss. (College of the Redemptionist Fathers).	Alexander W. Gordon	July 13, 1874
Ellsworth, Kans	Hon. W. A. Phillips, M. C	July 14, 1874
	M. W. Henry	July 21, 1874
Mount Lake or Bald Knob, Giles County, Va.	Mrs. H. Haupt	July 21, 1874
	William Terry, Mrs. H. Haupt	Dec. 22, 1876
Camden, N. J. (The River Iron Works).	Wood, Dialogue & Co	July 29, 1874
Bloomington and Decatur, Ill.	E. A. Gastman, chairman meteorological committee Macon County Fruit-Growers' Association.	Aug. 30, 1874
Mount Kearsarge, Warner, N. H.	John Eaton, Commissioner; Hon. N. G. Ordway; Hon. W. E. Chandler.	Oct. 28, 1874
Ceredo, W. Va	S. A. Forbes	Nov. 21, 1874
	Frank Hereford	June 10, 1876
Astoria, Oreg	Hon. J. H. Mitchell, United States Senate	Nov. 29, 1874
Fond du Lac, Wis	Hon. C. A. Eldridge, M. C.; J. W. Carney	Dec. 15, 1874
Corpus Christi, Tex	H. Taylor, postmaster	Jan. 4, 1875
	do	Jan. 15, 1875
	Hon. Gustave Schleicher, M. C.; Wm. Headon, mayor; R. I. Denny, secretary of city; J. P. Rodney, and 3 others.	Aug. 24, 1876
Lansing, Mich. (Michigan State Agricultural College).	R. C. Kedzie, professor of chemistry, &c	Jan. 12, 1875
Pana, Ill	E. C. Reese, postmaster	Jan. 17, 1875
Columbus, Ga	Hon. H. R. Harris, M. C	Jan. 19, 1875
	do	Jan. 20, 1876
Salisbury, N. C	Hon. W. M. Robbins, M. C	Jan. 20, 1875
Hartford, Conn	G. H. Kingsbury, chairman meteorological committee Tolland County Agricultural Society.	Jan. 21, 1875
Oshkosh, Wis	T. Floyd Woodworth, M. D	Jan. 22, 1875
Ames, Iowa (Iowa State Agricultural College).	J. K. Macomber, professor of physics	Jan. 23, 1875
Mount Anthony, Bennington, Vt.	George W. Robinson	Jan. 27, 1875
Pentwater, Mich	Hon. J. A. Hubbell, M. C.; Amos Dresser	Feb. 3, 1875
Fortress Monroe, Va	Hon. Jas. H. Platt, jr, M. C.; —— Phoebus, —— Watkins, and —— Wright.	Feb. 8, 1875
Afton, Iowa	Hon. Jas. W. McDill, M. C.; N. W. Rowell, W. R. Roberts, and 12 others:	Feb. 17, 1875
Mount Pisgah, Bradford County, Pa.	R. Redddington	Mar. 2, 1875
Marysville, Cal	Hon. J. K. Luttrell, M. C.; E. H. Pratt	Mar. 8, 1875
Jacksonville, Ill	Hon. J. A. Logan, United States Senate; G. V. Black, Samuel N. Martin, and H. G. Whitlock.	Mar. 15, 1875
Ironton, Ohio	Albert Lawson, W. F. McQuigg, and 24 others	Mar. 25, 1875
Isle of Shoals, N. H	John R. Poor, J. Albert Walker, John Walker, and 7 others.	Mar. 25, 1875
Saint Augustine, Fla	James Whitall	Mar. 31, 1875
Abingdon, Ill. (Abingdon College).	D. S. Harris, professor of natural sciences	Apr. 1, 1875
Helena, Mont	W. F. Sanders, Col. John Gibbon, Seventh United States Infantry, and 24 others.	Apr. 1, 1875

List of places for which stations have been requested, &c.—Continued.

Place.	Applicant.	Date.
Cape Vincent, N. Y	M. E. Lee, G. A. Bagley, and 26 others	Apr. 6, 1875
Hingham, Wis	Charles Rogers and F. A. Balch, meteorological committee Farmers' Club of Hingham.	Apr. 19, 1875
Three or four additional stations in the interior of Florida.	John P. Wall, M. D	May 6, 1875
Saint Joseph, Mich	Hon. T. W. Ferry, United States Senate; N. W. Napier, A. H. Potter, and 187 others.	May 26, 1875
Lake Charles, La	William Meyer, assistant postmaster	June 12, 1875
Tallahassee, Fla	Hon. S. B. Conover, United States Senate, and 41 others	June 12, 1875
Franklin, Idaho	J. Richardson	July 23, 1875
Lenoir, N. C	Clinton A. Cilley, late brevet lieutenant-colonel and acting assistant quartermaster, United States Army.	July 28, 1875
Johnsonville, Tenn., and Decatur, Ala.	J. M. Pettigrew, president, and J. S. Toof, secretary, of the Memphis Chamber of Commerce, and 101 others.	Aug. 15, 1875
Fort Dodge, Iowa	Frederick Hess	Nov. 4, 1875
Friendsville, Ill	James Pool	Nov. 6, 1875
Greencastle, Ind. (Asbury University.)	Alexander Martin, president	Nov. 18, 1875
	Hon. O. P. Morton, United States Senate; Alexander Martin, D. D., president of university.	Mar. 7, 1876
Block Island, R. I	Nicholas Ball	Nov. 24, 1875
	Hon. H. B. Anthony, United States Senate; Hon. A. E. Burnside, United States Senate; Hon. B. T. Eames, M. C.; Hon. L. W. Ballou, M. C.	Dec. 18, 1875
Danville, Va	J. R. Winston	Dec. 13, 1875
Delaware Breakwater	William Brockie, president Philadelphia Maritime Exchange; James Welsh, president Philadelphia Board of Trade, and 36 others.	Dec. 15, 1875
	J. E. Jouett, captain United States Navy	Dec. 22, 1875
Cape Henlopen	do	Dec. 22, 1875
Fulton, Ark	Jay Guy Lewis	Dec. 28, 1875
Provincetown, Mass	T. N. Stone, M. D.; John W. Davis, and 12 others	Jan. 21, 1876
Silver City, Idaho, Walla Walla, Wash. T., and Baker City, Oreg.	Hon. T. W. Bennett, Delegate from Idaho	Feb. 9, 1876
Carson City, Nebr	Hon. J. P. Jones, United States Senate; Hon. William Sharon, United States Senate; Hon. William Woodburn, M. C.; the governor, and numerous other State officials of Nevada.	Mar. 6, 1876
Madison, Wis. (University of Wisconsin).	Board of regents, by N. B. Van Slyke, chairman executive committee.	Mar. 11, 1876
Paw Paw, Mich	E. E. Rowland	Apr. 3, 1876
Carlisle, Pa	W. H. Cook	May 4, 1876
Fairbury, Nebr	Will. W. Watson, civil engineer	May 12, 1876
Sault de Ste. Marie, Mich	Samuel B. W. Covell	May 20, 1876
Kelly's Island, Ohio	D. K. Huntington, deputy collector of customs	May 25, 1876
Three Rivers, Mich	John Anable	May 30, 1876
Moffat, Tenn	John Francis	June 29, 1876
University of Missouri	Col. Rollins (through J. Eaton, Commissioner of the Board of Education).	July 17, 1876
Stowe, Vt	A. C. Stickney, civil engineer	Dec. 22, 1876
Alfred Centre, N. Y. (Alfred University).	H. E. Coon	Jan. 12, 1877
Anchorage, Ky. (Forest Academy).	Col. J. N. Current	Mar. 31, 1877
Charlotte, N. C	Charles R. Jones, secretary of Chamber of Commerce, and 120 others.	Mar. 31, 1877
Sandusky, Ohio	J. O. Moss, secretary Sandusky, Mansfield and Newark Railroad.	Apr. 14, 1877
	do	May 3, 1877
Monticello, Iowa	M. M. Moulton, city marshal; F. I. Tryon, mayor; M. W. Herrick, city attorney.	Apr. 15, 1877
Reed's Landing, Minn	T. B. Wilson & Co	June 25, 1877
Ocracoke, N. C	Thomas L. Tilton, M. F. Nelson, and 17 others, shipmasters, pilots, &c.	June 29, 1877

PAPER 11.

List of boards of trade, chambers of commerce, and other organizations, apart from those directly connected with agriculture, which had on June 30, 1877, appointed permanent committees to confer with the Chief Signal-Officer of the Army.

Name of organization.	State.	Committee.
Chamber of Commerce, New York	New York	E. Hincken, G. W. Blunt, J. S. T Stranahan, James H. Frothingham. F. B. Thurber.
Board of Trade, Buffalo	do	A. Richmond, G. S. Hazard, J. H. Vought.
Produce Exchange, Toledo	Ohio	E. F. Browne, H. D. Walbridge, S. C. Reynolds.
Board of Trade, Detroit	Michigan	Theo. P. Hall, J. Flynn, A. G. Hibbard.
Board of Trade, Chicago	Illinois	C. T. Trego, C. H. Blackman, C. W. Wheeler.
Board of Trade, Boston	Massachusetts	N. Spooner, T. Gaffield, J. Cummings, E. H. Sampson, E. Howes.
Chamber of Commerce, Milwaukee	Wisconsin	J. L. Hathaway, J. B. Merrill, E. M. Peck.
Chamber of Commerce, Duluth	Minnesota	C. M. Cushman, J. B. Culver, C. C. Jones.
Board of Trade, Baltimore	Maryland	R. B. Bayard, A. Reid, T. Poultney, jr., W. G. Bowdoin, D. L. Bartlett.
Board of Trade, Cleveland	Ohio	R. K. Winslow, R. T. Lyon, J. C. Sage.
Chamber of Commerce, Charleston	South Carolina	E. H. Frost, W. P. Hall, F. W. Dawson.
Chamber of Commerce, Memphis	Tennessee	B. J. Semmes, T. H. Allen, W. P. Prondfit.
Board of Trade, Oswego	New York	J. L. McWhorter, A. H. Failing, W. R Hosmer.
Committee appointed by mayor, Rochester.	do	G. Schofield, J. Siddons, H. S. Hebard.
Board of Trade, Portland	Maine	C. H. Farley, J. S. Bedlow, M. N. Rich.
Board of Trade, Philadelphia	Pennsylvania	W. S. Russell, H. Winsor, B. S. Janney, jr.
Board of Trade, Mobile	Alabama	Hon. P. Hamilton, Hon. P. Williams, sr., T. Henry, esq.
Chamber of Commerce, Wilmington	North Carolina	A. H. Van Bokkelen, G. Harriss, W. L. De Rosset.
Board of Trade, Indianapolis	Indiana	E. T. Cox, A. H. Pettit, H. C. Wilson.
Chamber of Commerce, Saint Paul	Minnesota	R. O. Sweeney, D. R. Breed, M. N. Kellog.
Merchants' Exchange, Saint Louis	Missouri	J. P. Keiser, J. Wahl, J. L. Pearce, T. G. Conant.
Board of Trade, Davenport	Iowa	J. M. Dalzel, F. W. Angell, C. E. Beiderbecke.
Board of Trade, La Crosse	Wisconsin	W. W. Jones, J. I. Lyndes, S. L. Nevins.
Cotton Exchange, New Orleans	Louisiana	J. I. Noble, J. J. Stewart, J. Lorber.
Chamber of Commerce, New Haven	Connecticut	Hon. H. G. Lewis, J. T. Platt.
Chamber of Commerce, Cairo	Illinois	W. P. Halliday, P. Cuhl.
Board of Trade, Cincinnati	Ohio	D. B. Pierson, J. A. Scarlett, J. Dexter.
Board of Trade, Dubuque	Iowa	Dr. A. Horr, J. S. Hetherington.
Board of Trade, Albany	New York	E. A. Durant, jr., J. F. Ames, W. Hailes, J. M. Batterman, H. S. Elmore, J. Taylor.
Chamber of Commerce, Savannah	Georgia	Gen. J. E. Johnston, Gen. J. F. Gilmer, Gen. H. C. Wayne.
Meteorological Committee, Springfield	Massachusetts	H. C. Lee, E. W. Bond, D. B. Wesson, J. G. Benton, M. C. Stebbins, D. L. Harris, W. W. Colburn, H. Foote, H. G. Stickney, A. C. Stone, E. Ingersoll, L. D. Brooks.
Meteorological Committee, Newport	Rhode Island	S. C. Bailey, S. W. Macy. B. Finch, T. Cogeshall, L. P. Clarke, S. H. Norman, S. Powell.
Chamber of Commerce, Cincinnati	Ohio	W. S. Munson, A. Erkenbrecher, H. Goepper.
Board of Trade, Nashville	Tennessee	J. D. Plunkett.
Cotton Exchange, Savannah	Georgia	C. M. Holst, J. M. Barnard, J. J. Wilder.
Cotton Exchange, Nashville	Tennessee	J. F. Wheeless.
Merchants' Club, Omaha	Nebraska	J. E. Boyd, G. H. Collins, O. H. Ballou, W. Stephens.
Chamber of Commerce, San Francisco	California	J. W. Raymond, C. A. Low, W. W. Dodge.
Merchants' Union, Jacksonville	Florida	F. Jordan, J. E. Hart, G. C. Wilson.
Polytechnic Society of Kentucky, Louisville.	Kentucky	J. L. Smith, J. D. O'Leary, S. G. Stevens.
Meteorological Committee, Indianola	Texas	Dr. H. Rosencrans, W. P. Milby, H. J. Huck.
Cotton Exchange, Mobile	Alabama	W. H. Gardner, J. A. McCaw, A. Proskauer.
Merchants' Exchange, Baltimore	Maryland	W. G. Atkinson, W. G. Loud, O. M. Vesper.
Board of Trade, Omaha	Nebraska	W. C. B. Allen, W. J. Broatch, D. S. Barriger.
Maritime Exchange, Philadelphia	Pennsylvania	E. K. Stevenson, J. S. Waln, W. W. Frazier, jr.

PAPER 12.

On January 16, 1877, the following resolution was suggested to the different boards of trade, chambers of commerce, and other organizations of a similar character, in communication with this office, for their adoption:

"That the meteorological committee of the board of trade shall be a permanent committee, and that the names of the members, and any changes in membership be, in each case, formally notified to the Chief Signal Officer of the Army. The committee will confer with the Chief Signal Officer, and will bring before the board all matters requiring its action or relating to aid needed for, or improvement of the signal-service."

The resolution was adopted and committees appointed as follows:

Mobile Board of Trade:

Committee.—Hon. P. Hamilton, Hon. P. Williams, sr., and T. Henry.

Chamber of Commerce of New York:

Committee.—Paul N. Spofford, George W. Blunt, Edward Hincken, J. S. T. Stranahan, and James H. Frothingham.

Saint Paul Chamber of Commerce:

Committee.—R. O. Sweeney, Rev. D. R. Breed, and M. N. Kellog.

Oswego Board of Trade:

Committee.—J. L. McWhorter, A. H. Failing, and W. R. Hosmer.

New Haven Chamber of Commerce:

Committee.—Henry G. Lewis and Johnson T. Platt.

Toledo Produce Exchange:

Committee.—E. F. Browne, H. D. Walbridge, and S. C. Reynolds.

New Orleans Cotton Exchange:

Committee.—John I. Noble, J. J. Stewart, and J. Lorber.

Savannah Cotton Exchange:

Committee.—C. M. Holst, J. Gammell, and J. M. Barnard.

Meteorological Committee of City of Rochester:

Committee.—George Schofield, John Siddons, and H. S. Hebard.

Merchants' Union of Jacksonville, Fla.:

Committee.—F. Jordan, J. E. Hart, and G. C. Wilson.

Polytechnic Society of Kentucky, Louisville:

Committee.—J. L. Smith, J. D. O'Leary, and S. G. Stevens.

Cincinnati Board of Trade:

Committee.—D. B. Pierson, J. A. Scarlett, and J. Dexter.

Baltimore Board of Trade:

Committee.—R. B. Bayard, A. Reid, T. Poultney, jr., W. G. Bowdoin, and D. L. Bartlett.

Chicago Board of Trade:

Committee.—Charles T. Trego, Charles H. Blackman, and Charles W. Wheeler.

Mobile Cotton Exchange:

Committee.—W. H. Gardner, J. A. McCaw, and A. Proskaner.

Philadelphia Board of Trade:

Committee.—W. S. Russell, H. Winsor, and B. L. Janney, jr.

Milwaukee Chamber of Commerce:

Committee.—J. L. Hathaway, J. B. Merrill, and E. M. Peck.

San Francisco Chamber of Commerce:

Committee.—J. W. Raymond, C. A. Low, and W. W. Dodge.

Omaha Board of Trade:

Committee.—W. C. B. Allen, W. J. Broatch, and D. S. Barriger.

Meteorological Committee of the City of Newport, R. I.:

Committee.—S. C. Bailey, Samuel Powell, L. P. Clarke, Benjamin Finch, Thomas Cogeshall, S. W. Macy, and S. H. Norman.

Philadelphia Maritime Exchange:
Committee.—Edward K. Stevenson, Jacob S. Waln, and W. W. Frazier, jr.

Detroit Board of Trade:
Committee.—Theodore P. Hall, James Flynn, and A. G. Hibbard.

Society of Natural History, San Diego:
Committee.—G. W. Barnes, Charles J. Fox, and O. N. Sanford.

Merchants' Exchange of Saint Louis:
Committee.—J. P. Keiser, J. Wahl, J. L. Pearce, and F. G. Conant.

The following rules were transmitted to the above-named committees for their guidance and the form of report desired, marked "Form L":

Rules for the government of the permanent meteorological committees of boards of trade, chambers of commerce, and other organizations appointed to co-operate with the Chief Signal Officer of the Army.

RESOLUTION.

POWERS OF COMMITTEE ON SIGNAL SERVICE—TRANSACTIONS OF 1877.

* * * * * * *

"*Resolved*, That the meteorological committee of the ——— ——— shall be a permanent committee, and that the names of the members and any changes in membership be, in each case, formally notified to the Chief Signal Officer of the Army. The committee will confer with the Chief Signal Officer, and will bring before the ——— ———, all matters requiring its action, or relating to aid needed for or improvement of the Signal Service."

RULE 1. All resolutions, memorials, or propositions of whatever character, relating to the meteorological or Signal Service, which may be brought before the ——— ———, are to be referred to the committee. Upon such reference, the committee will confer with the Chief Signal Officer upon the matter in question before making the committee's recommendation of action to the ——— ———, in order that, by interchange of opinion and by statement of facts, a full understanding may be had. It is also requested that, when any action may be taken by the ——— ——— on any of the above-named subjects, the committee will forward a statement or copy of the record direct to this office.

RULE 2. The committee will, from time to time, bring to the notice of the Chief Signal Officer any improvements or additions to the service, to be of certain benefit to the ——— ——— or to the interests represented by the ——— ———. In such cases it is expected the committee will first examine into and satisfy themselves of the practicability of the undertaking, and that it will be of an actual pecuniary value to the community they represent.

RULE 3. In cases occurring under Rule 2, the committee will, so far as practicable, make an estimate in amount of the pecuniary value hoped to result to the commercial or other interest sought to be benefitted by the addition requested.

RULE 4. The committee will make, either as a body or by a sub-committee, at least once in each month, a careful examination of the local office in the city in which they reside, and report to the Chief Signal Officer their findings, under their different headings, upon the blanks to be furnished for the purpose.

RULE 5. They will at once bring to the notice of the Chief Signal Officer any neglect or want of promptness at the station, or any delay in the reports or in the proper display of signals, or in the posting of bulletins, or of furnishing information to the press, or through other established methods, or any want of courteous and proper conduct on the part of the non-commissioned officer or persons in charge of or at the station, or conduct calculated to bring discredit upon the service of the United States.

RULE 6. The committee will bring to notice of the Chief Signal Officer conduct especially entitling the non-commissioned officer or assistants at the station to commendation, carefully specifying in such case the especial matter for which the station is commended. The simple discharge of routine duty in such way as to escape censure is not ground for especial commendation.

RULE 7. The committee will confer fully with the inspectors of the Signal Service at the times of their inspections, and will direct their attention to all matters the committee may consider as worthy of unusual attention. The Chief Signal Officer relies upon the committees to give the inspectors facilities for such examinations, and such assistance as will enable him to receive, for the Secretary of War, the fullest and most reliable information.

RULE 8. The committee will indicate to the Chief Signal Officer, for the information

of the Secretary of War, what maps, bulletins, or other modes of information can be used to best advantage, and where maps, instruments, &c., can be usefully displayed.

RULE 9. A copy of these rules, together with the names of the local committees and the resolution under which they are appointed, will be kept displayed in each local office.

RULE 10. The committee will endeavor to so arrange with the press, and in other modes of publication, that the information furnished by the office to the press will reach the members of the boards of trade, chambers of commerce, agricultural societies, ship-masters, ship-owners, and the community in as nearly as practicable the wording in which it is dispatched from this office. A neglect of this rule may lead to misapprehension and not unfrequently to disaster.

RULE 11. The committees at sea-ports or at lake-port cities, at river-ports, or representing fishing interests, will especially present the requirements of these different interests as to the coast, fishery, and port services. The committees at interior cities will indicate how agricultural, manufacturing, river, canal, or other cognate interests can be served.

RULE 12. Complaints as to defects at local stations may be addressed to the local committees, and will, in general, be brought to their attention before final action is taken in reference to them.

It is expected that the committee, representing to some extent the Signal Service, will endeavor to protect and advance the service by all proper methods, to this end aiding the non-commissioned officer in charge of local stations by advice or influence, in procuring suitable locations or other facilities for the public business, and by other co-operation for the public service.

RULE 13. The rules of this service require that changes in the details at stations be made from time to time. It is not to be considered as a reflection upon any non-commissioned officer or assistant that he is relieved at one and ordered to another station. Petitions or memorials, &c., requesting the detail of particular persons for particular stations are not encouraged.

OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, D. C.

(FORM L.)

Report of permanent committee of ——— ———.

———, ———, 1877.

The permanent meteorological committee of the ——— ——— has, at the request of the Chief Signal-Officer, examined the office of the Signal Service in this city, and reports its condition as follows:

Office rooms..... { Clean and well kept?
[Yes or no.] { Convenient?

Instruments..... Clean, and in apparent good condition?
[Yes or no.]

Books and paper..... { Neatly kept?
[Yes or no.] { Apparently accurate?

Office library..... Books carefully handled?

Signals displayed..... At
[Names of places or building.]

Signal display..... Considered prompt and useful?
[Yes or no.]

Flags and lights..... Good?
[Yes or no.]

This station was examined without previous notice given.

———, ———.
(Signature of chairman.)

REMARKS.

Under this head to be noted any facts to be more directly brought to the attention of the Chief Signal Officer in relation to the subjects above.

NOTE.—Letters inviting attention of the Chief Signal-Officer to subjects requiring other than routine action, or which demand especial consideration, are requested to be addressed direct to the Chief Signal-Officer of the Army at Washington, D. C.

PAPER 13.

List of volunteer observers who have forwarded monthly reports to the Chief Signal-Officer during the year ending June 30, 1877.

Name of observer.	Post-office address.	State.
Albree, George	Pittsburgh, Allegheny County	Pennsylvania.
Anderson, Rev. John	Clarksville, Red River County	Texas.
Aston, Edward J	Asheville, Buncombe County	North Carolina.
Arden, Thomas B	Garrison's, Putnam County	New York.
Allan, W. T	Geneseo, Henry County	Illinois.
Allison, Dr. John A	Statesville, Iredell County	North Carolina.
Abbott, Dr. E. K	Salinas City, Monterey County	California.
Alison, Dr. H. L	Minter Station, Dallas County	Alabama.
Armstrong, Rev. G. C	Fayette, Jefferson County	Mississippi.
Andrews, Luman	Southington, Hartford County	Connecticut.
Ashby, M. V	Afton, Union County	Iowa.
Alden, Thomas E	Rising Sun, Ohio County	Indiana.
Allin, Lucius C	Springfield, Hampden County	Massachusetts.
Adriance, C. E	Hector, Schuyler County	New York.
Amos, Franklin	Ringgold, Morgan County	Ohio.
Abington College*	Abington, Knox County	Illinois.
Alden, George J	New Smyrna, Volusia County	Florida.
Agricultural College Farm	New Brunswick, Middlesex County	New Jersey.
Agricultural Department, State of Georgia.*	Atlanta, Fulton County	Georgia.
Adams, Prof. E. W	Goldsborough, Wayne County	North Carolina.
Altaffer, J. M	Independence, Montgomery County	Kansas.
Beans, Thomas J	Moorestown, Burlington County	New Jersey.
Breed, J. E	Embarrass, Waupacca County	Wisconsin.
Bentley, E. T	Tioga, Tioga County	Pennsylvania.
Beecher, Charles	Newport, Wakulla County	Florida.
Bateman, J. H	Dover, Kent County	Delaware.
Beal, William	Murphy, Cherokee County	North Carolina.
Bullard, R	Litchfield, Hillsdale County	Michigan.
Barringer, William	Bellefontaine, Logan County	Ohio.
Blanchard, O. A	Elmira, Stark County	Illinois.
Bell, Joseph	Franklin, Venango County	Pennsylvania.
Bowman, Peter	Savannah, Ashland County	Ohio.
Bœrner, Prof. Charles G	Vevay, Switzerland County	Indiana.
Beall, Dr. and Mrs. R. L	Lenoir, Caldwell County	North Carolina.
Brendell, Frederick	Peoria, Peoria County	Illinois.
Barker, Ebenezer	Saint Mary's, Camden County	Georgia.
Bryant, A. F	Clear Creek, Saunders County	Nebraska.
Bartlett, E. B	Vermillion, Oswego County	New York.
Beloit College	Beloit, Rock County	Wisconsin.
Ballou, N. E	Sandwich, De Kalb County	Illinois.
Bluhm, P. C.*	Smithville, De Kalb County	Tennessee.
Brown, Charles N	Utica, Dane County	Wisconsin.
Blodgett, Charles	Howard, Nemaha County	Nebraska.
Bullock, Thomas	Coalville, Summit County	Utah.
Brown, Henry W.*	Richmond, Furnace County	Nebraska.
Blood, Charles F	Waltham, Middlesex County	Massachusetts
Baker, D. W. C	Austin, Travis County	Texas.
Benedictine Fathers	Saint Meinrad's Abbey, Spencer County	Indiana.
Bower, Dr. William W	Mount Sterling, Brown County	Illinois.
Breedon, Jacob	Adrian, Lenawee County	Michigan.
Beans, W. Y.*	Rolla, Phelps County	Missouri.
Benton, E. H.*	Le Roy, Dodge County	Wisconsin.
Boies, A. H.*	Hudson, Lenawee County	Michigan.
Behrens, Charles M.*	Emporium, Cameron County Bradford, McKean County	Pennsylvania.
Bricker, Dr. J. W.*	Wooster, Wayne County	Ohio.
Brewster, J.*	Okalooska, Ouachita County	Louisiana.
Breckenridge, Cabell.*	Kingston, Roane County Rock, Roane County	Tennessee.
Barrows, Storrs.*	South Trenton, Oneida County	New York.
Beckes, R. B.*	Grand Haven, Osage County	Kansas.
Child, Dr. A. L	Plattsmouth, Cass County	Nebraska.
Clark, Dr. J. T., and Miss E. J	Mount Solon, Augusta County	Virginia.
Chandler, Dr. William J	South Orange, Essex County	New Jersey.
Carlton A. Y	Wet Glace, Camden County	Missouri.
Cutting, Dr. Hiram A	Lunenburg, Essex County	Vermont.
Cummings, James	Tarentum, Allegheny County	Pennsylvania.
Cheney William	Minneapolis, Hennepin County	Minnesota.
Crosier, Adam	Laconia, Harrison County	Indiana.
Collin, John.*	Shelburne, Coos County	New Hampshire
Crane, George W	Bethel, Clermont County	Ohio.
Carman, James S	Jacksonville, Tompkins County	New York.
Cutler, J. L	Quitman, Brooks County	Georgia.
Cochrane, Joseph	Havana, Mason County	Illinois.
Cooke, Dr. William H	Carlisle, Cumberland County	Pennsylvania.

* Indicates that observers have ceased sending reports.

List of volunteer observers who have forwarded monthly reports, &c.—Continued.

Name of observer.	Post-office address.	State.
Curtiss, W. W.	Rocky Run, Columbia County	Wisconsin.
Cooke, E. R.	Trenton, Mercer County	New Jersey.
Couch, E. D	Contoocookville, Merrimac County	New Hampshire.
Collin, Prof. Alonzo*	Mount Vernon, Linn County	Iowa.
Chase, Dr. D. H	Louisville, Clay County	Illinois.
Curtiss, George G	Fallston, Harford County	Maryland.
Clark, T. A	Weldon, Halifax County	North Carolina.
Chappellsmith, John	New Harmony, Posey County	Indiana.
Colby, Alfred	Amoskeag, Merrimac County	New Hampshire.
Chamberlin, S. N	Daytona, Volusia County	Florida.
Cline, Frederick P	Mesquite, Dallas County	Texas.
Calhoun, P. B	Austin, Wilson County	Tennessee.
Cornell University	Ithaca, Tompkins County	New York.
Clift, Henry A.*	Harbor Grace	Newfoundland.
Colt, Henry H	Nora Springs, Floyd County	Iowa.
Castleman, A. L.*	San José, Santa Clara County	California.
Cutler, Rev. B. B	Chepatchet, Providence County	Rhode Island.
Chalfant, W. F	Burlingame, Osage County	Kansas.
Caldwell, John W	Clarksville, Montgomery County	Tennessee.
Day, Theo.*	Dyberry, Wayne County	Pennsylvania.
Dewhurst, Rev. E	Mystic, New Haven County	Connecticut.
Dunbar, John B	Topeka, Shawnee County	Kansas.
Davis, Mrs. D. D	Webster, Jackson County	North Carolina.
Doak, Mrs. Julia A	Tusculum College, Greene County	Tennessee.
Dawson, William	Spiceland, Henry County	Indiana.
Doton, Hosea	Woodstock, Windsor County	Vermont.
Dunn, William	Emerson, Otoe County	Nebraska.
Dickinson, J. P	Guttenberg, Clayton County	Iowa.
Davis, Jacob	Florida, Berkshire County	Massachusetts.
Dunning, I. S	Dennison, Crawford County	Iowa.
Davis, A. R.*	Wabash, Wabash County	Indiana.
Draper, Prof. Daniel	New York City	New York.
Dennis, W. A.*	Somonauk, De Kalb County	Illinois.
Dunn, George*	Nottoway, Nottoway County	Virginia.
Emery, Josiah	Williamsport, Lycoming County	Pennsylvania.
Ellicott, James F	Saint Inigoes, Saint Mary's County	Maryland.
Ellis, Edwin	Ashland, Ashland County	Wisconsin.
Edgington, R. P	Stanley, Johnson County	Kansas.
Engelstad, R. M	Mount Carmel, Kane County	Utah.
Edwards, Daniel	Nile, Allegany County	New York.
Ellis, J. M	Philadelphia	Pennsylvania.
Eddy, L	Danville, Boyle County	Kentucky.
Evans, D. J	Merow, Sullivan County	Indiana.
Emmet, Thomas A	Carmel, Putnam County	New York.
Emery, William S.*	Pine Valley, San Diego County	California.
Farquhar, Allan	Sandy Springs, Montgomery County	Maryland.
Foster, H	Cleveland, Bradley County	Tennessee.
Fox, Fred. E	Mount Fairview, San Diego County	California.
Ferriss, E. J	Painesville, Lake County	Ohio.
Fallon, J	Lawrence, Essex County	Massachusetts.
Foster, R. W	New Orleans, Orleans Parish	Louisiana.
Fleming, John	Readington, Hunterdon County	New Jersey.
Fuller, A. N	Hermosa, La Plata County	Colorado.
Fernald, Prof. M. C	Orono, Penobscot County	Maine.
Friend, Charles W	Carson City, Ormsby County	Nevada.
Friel, Joseph*	Cloverport, Hancock County	Kentucky.
Fortescue, J	York Factory	Canada.
Gardiner, R. H	Gardiner, Kennebec County	Maine.
Gilman, R. H	Milford, Kent County	Delaware.
Gillingham, C	Accotink, Fairfax County	Virginia.
Gillespie, Dr. S. W	Sterling, Whiteside County	Illinois.
Green, H. A	Atco, Camden County	Georgia.
Geddings, Dr. W. H	Aiken, Aiken County	South Carolina.
Gardner, O. A. A	Center Mound, Republic County	Kansas.
Grathwohl, John	Blooming Grove, Pike County	Pennsylvania.
Glasco, J. M	Gilmer, Upshur County	Texas.
Goodlander, Harry	Leesburg, Kosciusko County	Indiana.
Green, Dr. J. C	West Chester, Chester County	Pennsylvania.
Gleitsmann, Dr. W	Asheville, Buncombe County	North Carolina.
Grant, John	Frankford, Pike County	Missouri.
Gundrum, Jacob*	Hanover, York County	Pennsylvania.
Gowey, H. D	North Lewisburg, Champaign County	Ohio.
Hardy, R. T	Troy, Rensselaer County	New York.
Henry, Mrs. Rachel M. B	Foster's Crossings, Warren County	Ohio.
Hyde, Mr. and Mrs. G. A	Cleveland, Cuyahoga County	Do.
Howard, jr., T. T	Jersey City, Hudson County	New Jersey.
Hoskinson, R. M.	Seattle, King County	Washington Territory.
	Burlingame, Osage County	Kansas.
	Cloverdale, Sonoma County	California.
Harper, George W	Cincinnati, Hamilton County	Ohio.
Howard, S. A	Greensborough, Guilford County	North Carolina.

* Indicates that observers have ceased sending reports.

List of volunteer observers who have forwarded monthly reports, &c.—Continued.

Name of observer.	Post-office address.	State.
Hurlin, Rev. William	Plaistow, Rockingham County	New Hampshire.
Hammitt, John W	College Hill, Hamilton County	Ohio.
Horn, David B	Keswick Station, Albermarle County	Virginia.
Hayworth, John	Hazleton, Luzerne County	Pennsylvania.
Higgins, F. W	Detroit, Wayne County	Michigan.
Hyland, William	Baxter Springs, Cherokee County	Kansas.
Howell, Robert	Nichols, Tioga County	New York.
Hunt, George M	North Argyle, Washington County	Do.
Haywood, John, son, and daughter	Westerville, Franklin County	Ohio.
Hoadley, James H.*	Santa Cruz, Santa Cruz County	California.
Hardy, Dr. J. F. E.*	Asheville, Buncombe County	North Carolina.
Horn, Dr. H. B., and Miss Martha*	Atchison, Atchison County	Kansas.
Hubbs, Dr. J. A	Brownsville, Fayette County	Pennsylvania.
Hopkins, Dr. H. H	New Market, Frederick County	Maryland.
Hills, F. T	Manchester, Rockingham County	New Hampshire.
Hering, C. J	Paramaribo, Colony of Surinam	South America.
Harcourt, Jay	Wappinger's Falls, Dutchess County	New York.
Hinrichs, Prof. G	Iowa City, Johnson County	Iowa.
Harvard College Observatory	Cambridge	Massachusetts.
Hornung, C.*	Tiffin, Seneca County	Ohio.
Harrold, U. B.*	Americus, Sumter County	Georgia.
Henry, Mrs. Rachel M. B.*	Foster's Crossings, Warren County	Ohio.
Hamill, Robert S.*	Westminster, Windham County	Vermont.
Hardee, John*	Olive Furnace, Lawrence County	Ohio.
Ingram, Dr. John	Vineland, Cumberland County	New Jersey.
Ingalsbe, Granville	South Hartford, Washington County	New York.
Iowa State Agricultural College	Ames, Story County	Iowa.
Indiana State University*	Bloomington, Monroe County	Indiana.
James, John W	Marengo, McHenry County	Illinois.
Johnson, Rev. Samuel*	Rodman, Jefferson County	New York.
Jennison, H. L	Starkey, Yates County	Do.
Jennings, Dr. S. K	Purdy, McNairy County / Jackson, Madison County	Tennessee.
Johnston, Prof. John*	Middletown, Middlesex County	Connecticut.
Jones, Ira B	Neillsville, Clark County	Wisconsin.
Kron, F. J	Albermarle, Stanley County	North Carolina.
Kirkpatrick, J. A	Philadelphia, Philadelphia County	Pennsylvania.
Keeler, W. F	Mayport, Duval County	Florida.
Kedzie, R. C.*	Lansing, Ingham County	Michigan.
Keese, G. P	Cooperstown, Otsego County	New York.
Kohler, Edw	Egypt, Lehigh County	Pennsylvania.
Kentgen, Charles	Stapleton, Richmond County	New York.
King, Dr. J. S	Decatur, Macon County	Illinois.
Keenan, Mrs. W. E. A	Brookhaven, Lincoln County	Mississippi.
Kaucher, William	Oregon, Holt County	Missouri.
Kedzie, Prof. W. K	Manhattan, Riley County	Kansas.
Kennedy, Dr. and Mrs. T. J.*	Castalian Springs, Sumner County	Tennessee.
Kentgin, Charles*	Stapleton, Richmond County	New York.
Keene, E. M*	Salem, Greenbrier County	West Virginia.
Lüps, Misses C. and J	Manitowoc, Manitowoc County	Wisconsin.
Lewis, Miss Blanche L	McMinnville, Warren County	Tennessee.
Lewis, James	Kanab, Kane County	Utah.
Letton, J. E	Bethel, Bath County / Nicholasville, Jessamine County	Kentucky.
Lincoln, J. R	Boonsborough, Boone County	Iowa.
Lines, Dr. L. H	Okahumpka, Sumter County	Florida.
Lafferty, John F	Martinsville, Clark County	Illinois.
Lapham, A. Milton	Springfield, Greene County	Missouri.
Lamberton, W. R	Pelham, Westchester County	New York.
Lee, Fred*	Canton, Saint Lawrence County	Do.
Lee, E. N. and G. W*	Webster City, Keokuk County	Iowa.
Meyer, William*	La Charles, Calcasieu Parish	Louisiana.
Miller, Rev. Frank*	Pennington, Mercer County	New Jersey.
Matlock, W. B	Salem, Salem County	Do.
Merriam, G. T	San Louis Rey, San Diego County	California.
Moss, G. B	Belvidere, Boone County	Illinois.
Metcalf, John G	Mendon, Worcester County	Massachusetts.
Moore, C. R	Bridgetown, Northampton County	Virginia.
Moulton, J. P	Sebago Lake, Cumberland County	Maine.
Mead, S. B	Augusta, Hancock County	Illinois.
Martin, Horace	Corning, Holt County	Missouri.
Morris, Prof. O. W.*	New York, New York County	New York.
Morelle, Rev. Daniel	Wilmington, New Hanover County	North Carolina.
McConnell, E. M	New Castle, Lawrence County	Pennsylvania.
Mueller, Dr. R	Carthagena, Mercer County	Ohio.
Marshall, Gregory	Cresco, Howard County	Iowa.
McCready, Miss Lucy A	Fort Madison, Lee County	Do.
Mathews, J. McD	Hillsborough, Highland County	Ohio.
Moore, Nathan*	Grampian Hills, Clearfield County	Pennsylvania.
Merriwether, Charles I	Boonsborough, Bedford County	Virginia.
McIlvane, Charles J	Kensico, Westchester County	New York.

* Indicates that observers have ceased sending reports.

List of volunteer observers who have forwarded reports, &c.—Continued.

Name of observer.	Post-office address.	State.
Meehan, Thomas	Germantown, Philadelphia County	Pennsylvania.
Maxwell, Samuel A	Como, Whiteside County	Illinois.
	Lynden, Whiteside County	
McGill College	Montreal	Canada.
Merritt, jr., J. C	Farmingdale, Queens County	New York.
Morris, Rev. John	Firesteel, Dawson County	Montana Territory.
Mount Saint Mary's College	Emmittsburg, Frederick County	Maryland.
Moulton, M. M	Monticello, Jones County	Iowa.
McDonough School	Owing's Mills, Baltimore County	Maryland.
Mackall, jr., B. F	Moorhead, Clay County	Minnesota.
Madiem, W. F	Ephratah, Lancaster County	Pennsylvania.
McDougal, Charles E	Milton, Santa Rosa County	Florida.
Mosher, Theo., jr., Lieutenant Twenty-second U. S. Infantry.	Fort Mackinaw	Michigan.
Marsden, Dr. J. H. *	York Sulphur Springs, Adams County	Pennsylvania.
Munn, Arch. *	Harbor Grace	Newfoundland.
Muscatt, John M. *	Atlanta, Rice County	Kansas.
McLeod, R. R	Lompoc, Santa Barbara County	California.
Newcomb, G. S	Westborough, Worcester County	Massachusetts.
Noll, A. B	New Germantown, Hunterdon County	New Jersey.
	Linden, Union County	
Nettleton, E. S	South Pueblo, Pueblo County	Colorado.
Neill, Thomas	Venice, Erie County	Ohio.
Nason, Rev. Elias	North Billerica, Middlesex County	Massachusetts.
Nixon, J. Sharpe	Chambersburg, Franklin County	Pennsylvania.
Newbegin, Dr. J. D	Anna, Union County	Illinois.
Osborn, Ethan	Hennepin, Putnam County	Do.
Owsley, Dr. J. B	Jacksonsburg, Butler County	Ohio.
Owens, Dr. J. A. *	Monticello, Drew County	Arkansas.
O'Hagan, J	Greenville, Pitt County	North Carolina.
Partrick, J. M	North Volney, Oswego County	New York.
Phelps, Samuel B. *	Norwich, Windsor County	Vermont.
Parker, J. D	Mount Desert, Hancock County	Maine.
Peck, George H. *	El Monte, Los Angeles County	California.
Pearce, Thomas	Eola, Polk County	Oregon.
Pool, James *	Friendsville, Wabash County	Illinois.
Perry, William D. *	Hudson, Columbia County	New York.
Pollock, J. E	Salem, Cumberland County	Ohio.
	Alliance, Stark County	
Phillips Academy *	Andover, Essex County	Massachusetts.
Phillips, W. H. H. *	Wilbraham, Hampden County	Do.
Peddie Institute *	Heightstown, Mercer County	New Jersey.
Quarterman, E. A	Flushing, Queens County	New York.
Rodman, Miss Susan	New Bedford, Bristol County	Massachusetts.
Robins, C. E	Summit, Rio Grande County	Colorado.
Reynolds, A	Independence, Buchanan County	Iowa.
Richardson, C. F	Freehold, Monmouth County	New Jersey.
Robertson, Thomas D	Rockford, Winnebago County	Illinois.
Roos, Charles	New Ulm, Brown County	Minnesota.
Robertson, R. S	Fort Wayne, Allen County	Indiana.
Runge, C	New Ulm, Austin County	Texas.
Rockwell, Charlotte	Colebrook, Litchfield County	Connecticut.
Remington, C. V. S	Fall River, Bristol County	Massachusetts.
Ring, John J	San Bernardino, San Bernardino County	California.
Rotch, William	Fall River, Bristol County	Massachusetts.
Ralston, E	Weston, Lewis County	West Virginia.
Ruhe, E	Wartburg, Morgan County	Tennessee.
Seltz, Charles	De Soto, Washington County	Nebraska.
Smith, E. Allan	Moriches, Suffolk County	New York.
Shriver, E. T	Cumberland, Alleghany County	Maryland.
Smith, Dr. William	Cannonsburg, Washington County	Pennsylvania.
Streng, L. H. *	Grand Rapids, Kent County	Michigan.
Smith, Dr. C. H	Kenton, Hardin County	Ohio.
Soule, Prof. William	Cazenovia, Madison County	New York.
Stern, Jacob F	Logan, Harrison County	Iowa.
Scott, Thomas G	Forsyth, Monroe County	Georgia.
Scott, T. M	Melissa, Collin County	Texas.
Snell, E. S	Amherst, Hampshire County	Massachusetts.
Spooner, Dr. Stillman	Oneida, Madison County	New York.
Slenker, Elmina P. D	Snowville, Pulaski County	Virginia.
Smith, Rev. G. N	Northport, Leelenaw County	Michigan.
Slade, Elisha	Somerset, Bristol County	Massachusetts.
Shoemaker, J. L. *	Le Roy, Coffey County	Kansas.
Smith, C. J	Hudson, Summit County	Ohio.
Sherman, J. M	Hampton, Elizabeth City County	Virginia.
Sessions, Lewis	Norfolk, Madison County	Nebraska.
Spaulding, John	Wautoma, Waushara County	Wisconsin.
Snow, Prof. Frank H	Lawrence, Douglas County	Kansas.
Sturtevant, E. T	~~Biscayne, Dade County~~	~~Florida.~~
Stephenson, Dr. M. F	Gainesville, Hall County	Georgia.

*Indicates that observers have ceased sending reports.

List of volunteer observers who have forwarded reports, &c.—Continued.

Name of observer.	Post-office address.	State.
Sommerville, W. B.*	Wilsonville, Shelby County	Alabama.
Southern Illinois Normal University.	Carbondale, Jackson County	Illinois.
Sessions, S. A.*	Traverse City, Grand Traverse County	Michigan.
Seaver, Henry H.*	Claremont, Sullivan County	New Hampshire.
Stucky, D. C. F	Helvetia, Randolph County	Virginia.
Straight, Isaac	Walla Walla, Walla Walla County	Washington Territory.
Smith, Rev. W	Spartanburg, Spartanburg County	South Carolina.
Scribner, H. F. J	Strafford, Orange County	Vermont.
Sanford, Shelton P	Macon, Bibb County	Georgia.
Smith, B. B	Ellinwood, Barton County	Kansas.
Shriver, Howard	Wytheville, Wythe County	Virginia.
Siler, Mrs. A	Franklin, Macon County	North Carolina.
School of Mines	Golden, Jefferson County	Colorado.
Smith, Mrs. M. D.*	Whatcom, Whatcom County	Washington Territory.
Saint Lawrence University*	Canton, Saint Lawrence County	New York.
Smith, Daniel	Honolulu	Sandwich Islands.
Sanborn, J. F	Tabor, Fremont County	Iowa.
Tayloe, Ed.*	Comorn, King George County	Virginia.
Truman, George S	Genoa, Platte County	Nebraska.
True, Dr. H. A.*	Marion, Marion County	Ohio.
Talbot, Benjamin	Council Bluffs, Pottawattamie County	Iowa.
Tutwiler, H	Green Spring, Hale County	Alabama.
Tripp, O. H. and L. S	Surry, Hancock County	Maine.
Thralls, George R	Welborn, Suwannee County	Florida.
Townsend, Isaac	Capeville, Northampton County	Virginia.
Trowbridge, David	Waterburg, Tompkins County	New York.
Teele, Rev. A. H	Blue Hill, Norfolk County	Massachusetts.
Turner, Ernest	Point Pleasant	Louisiana.
Trembley, J. B	Oakland, Alameda County	California.
Tarleton, C. W	Worcester, Worcester County	Massachusetts.
Trouvelot, L	Cambridge	Do.
Todd, D. P	Naval Observatory, Washington	District of Columbia.
Thompson, Rev. D	Arkansas City, Cowley County	Kansas.
University of Wisconsin	Madison, Dane County	Wisconsin.
Vanhekle, J. M	Camden, Camden County	New Jersey.
	Delaware City, Newcastle County	Delaware.
Valenti, A. X	Woodstock, Howard County	Maryland.
Walter, Dr. James	Holton, Jackson County	Kansas.
	Sedgewick, Harvey County	
Watkins, Prof. A. B	Adams, Jefferson County	New York.
West, Silas	Cornish, York County	Maine.
Wild, Rev. E. P	Newport, Orleans County	Vermont.
Winchell, Prof. and Mrs. N. H	Minneapolis, Hennepin County	Minnesota.
Walton, J. P	Muscatine, Muscatine County	Iowa.
Whitehead, W. A	Newark, Essex County	New Jersey.
Wadey, H	Rockford, Floyd County	Iowa.
White, I. H	Cincinnati, Hamilton County	Ohio.
Wilber, Benjamin F	West Waterville, Kennebec County	Maine.
Williams, Milo G	Urbana, Champaign County	Ohio.
Wheaton, Mrs. D. B	Independence, Buchanan County	Iowa.
Whiting, William H	Geneva Lake, Walworth County	Wisconsin.
Wing, Miss Minerva E	West Charlotte, Chittenden County	Vermont.
Willis, O. R	White Plains, Westchester County	New York.
Wylie, William	Mount Forest, Ontario County	Canada.
Whittington, Granville	Mount Ida, Montgomery County	Arkansas.
Williams College	Williamstown, Berkshire County	Massachusetts.
Whitney, C. E	Creswell, Marion County	Kansas.
Winnipisoegee Lake Cotton and Woolen Manufacturing Company.	Weir's Landing, Belknap County	New York.
	Wolfborough, Carroll County	
	Lake Village, Belknap County	
	Bristol, Grafton County	
	Ashland, Grafton County	
Woodworth, Dr. A	Council Grove, Morris County	Kansas.
White, T. Baxter	Highlands, Mason County	North Carolina.
Winslow, J. E.*	Virgil, Cortland County	New York.
Waite, S. E.*	Traverse City, Grand Traverse County	Michigan.
Warne, Dr. George*	Independence, Buchanan County	Iowa.
Wooster, C. A.*	North Hammond, Saint Lawrence County	New York.
Woodbury, C. W. and L. W.*	Sibley, Sibley County	Minnesota.
Warner, Dr. C. O.*	Durham, Washington County	Arkansas.
Witter, D. R.*	Council Bluffs, Pottawattamie County	Iowa.
Young, George R	Penn Yan, Yates County	New York.
United States Naval Hospital	Mare Island	California.
Do	New York	New York.
Do	Philadelphia	Pennsylvania.
Do	Yokohama	Japan.

* Indicates that observers have ceased sending reports.

PAPER 14.

List of military posts from which regular meteorological reports have been received monthly at the Office of the Chief Signal-Officer during the year ending June 30, 1877.

Post.	State.	Post.	State.
Abercrombie, Fort	Dakota.	McDermitt, Camp	Nevada.
Abraham Lincoln, Fort	Do.	McDowell, Camp	Arizona.
Adams, Fort	Rhode Island.	McHenry, Fort	Maryland.
Alcatraz Island	California.	McKavett, Fort	Texas.
Angel Island	Do.	McPherson Barracks	Georgia.
Apache, Camp	Arizona.	McPherson, Fort	Nebraska.
Augusta Arsenal*	Georgia.	Mojave, Camp	Arizona.
Baker, Camp	Montana.	Monroe, Fort	Virginia.
Baton Rouge Barracks	Louisiana.	Mount Vernon Barracks	Alabama.
Bayard, Fort	New Mexico.	Niagara, Fort	New York.
Benicia Barracks	California.	Oglethorpe Barracks	Georgia.
Benton, Fort	Montana.	Ontario, Fort	New York.
Bidwell, Camp	California.	Pembina, Fort	Dakota.
Bliss, Fort*	Texas.	Plattsburg Barracks	New York.
Boise, Fort	Idaho.	Point San José	California.
Bowie, Camp	Arizona.	Porter, Fort	New York.
Brady, Fort	Michigan.	Preble, Fort	Maine.
Bridger, Fort	Wyoming.	Presidio of San Francisco	California.
Brown, Camp	Do.	Raleigh*	North Carolina.
Brown, Fort	Texas.	Randall, Fort	Dakota.
Buford, Fort	Dakota.	Rice, Fort	Do.
Canby, Fort	Washington Ter.	Richardson, Fort	Texas.
Carlisle Barracks*	Pennsylvania.	Ringgold Barracks	Do.
Clark, Fort	Texas.	Ripley, Fort	Minnesota.
Columbia	South Carolina.	Rock Island armory and arsenal. *	Illinois.
Columbus Barracks	Ohio.	Sanders, Fort	Wyoming.
Columbus, Fort	New York.	Selden, Fort	New Mexico.
Colville, Fort	Washington Ter.	Seward, Fort	Dakota.
Concho, Fort	Texas.	Shaw, Fort	Montana.
Craig, Fort	New Mexico.	Sheridan, Camp	Nebraska.
Douglas, Camp	Utah Territory.	Sidney Barracks	Do.
Duncan, Fort	Texas.	Sill, Fort	Indian Territory.
Ellis, Fort	Montana.	Sitka	Alaska.
Fetterman, Fort	Wyoming.	Snelling, Fort	Minnesota.
Foote, Fort	Maryland.	Stambaugh, Camp	Wyoming.
Fred Steele, Fort	Wyoming.	Stanton, Fort	New Mexico.
Garland, Fort	Colorado.	Stevens, Fort	Oregon.
Gaston, Camp	California.	Stevenson, Fort	Dakota.
Grant, Camp	Arizona.	Saint Augustine (Saint Francis Barracks).	Florida.
Gratiot, Fort	Michigan.	Sully, Fort	Dakota.
Griffin, Fort	Texas.	Sisseton, Fort	Do.
Hall, Fort*	Idaho.	Thomas Barracks	Alabama.
Halleck, Camp	Nevada.	Totten, Fort	Dakota.
Hamilton, Fort	New York.	Townsend, Fort	Washington Ter.
Harney, Camp	Oregon.	Union, Fort	New Mexico.
Hartsuff, Fort	Nebraska.	Verde, Camp	Arizona.
Hays, Fort	Kansas.	Wadsworth, Fort	Dakota.
Independence, Camp	California.	Wadsworth, Fort	New York.
Independence, Fort	Massachusetts.	Wallace, Fort	Kansas.
Jackson Barracks*	Louisiana.	Walla Walla, Fort	Washington Ter.
Johnston, Fort*	North Carolina.	Warren, Fort	Massachusetts.
Klamath, Fort	Oregon.	Wayne, Fort	Michigan.
Lapwai, Fort	Idaho.	West Point Military Academy.	New York.
Laramie, Fort	Wyoming.	Whipple, Fort	Arizona.
Larned, Fort	Kansas.	Willets Point	New York.
Leavenworth, Fort	Do.	Wingate, Fort	New Mexico.
Lowell, Camp	Arizona.	Wrangel, Fort	Alaska.
Lower Brulé agency	Dakota.	Yuma, Fort	California.
Lyon, Fort	Colorado.		
Macon, Fort*	North Carolina.		
Madison Barracks*	New York.		

* Posts which have discontinued their reports.

PAPER 15.

List of merchant and naval vessels, and naval stations, from which simultaneous meteorological reports have been received at the Office of the Chief Signal-Officer, during the year ending June 30, 1877.

MERCHANT VESSELS.

Name.	Months for which reports were received.	Line.
Steamship Nurnberg	January to June, 1877, inclusive	North German Lloyd of Bremen.
Steamship Braunschweig	May and June, 1877	
Steamship Berlin	November and December, 1876, and April, May, and June, 1877.	
Steamship Leipzig	July to December, 1876, inclusive	
Steamship Ohio	June, 1877	
Steamship Baltimore	February, March, and April, 1877	
Steamship Hibernian	August, September, and October, 1876	Allan Line.
Steamship Nova Scotian	July to December, 1876, inclusive, and June, 1877.	Do.
Steamship City of Peking	April, May, and June, 1877	Pacific Mail Steamship Company.
Steamship Gaelic	June, 1877	Occidental and Oriental Steamship Company.
Steamship Elizabeth	October, November, and December, 1876	German naval steamer.
Schooner Addie Fuller	July, 1876, to June, 1877, inclusive	

UNITED STATES NAVAL VESSELS.

Name.	Months for which reports were received in 1877.	Name.	Months for which reports were received in 1877.
Adams	January, April, and May.	Michigan	January to June, inclusive.
Ajax	January.	Monongahela	Do.
Alert	April to June, inclusive.	Monocacy	April to June, inclusive.
Alliance	March to June, inclusive.	New Hampshire	January to June, inclusive.
Ashuelot	Do.	Ohio	Do.
Canonicus	January to June, inclusive.	Osaipee	Do.
Colorado	Do.	Plymouth	Do.
Catskill	January.	Pensacola	Do.
Dictator	Do.	Powhatan	April and May.
Despatch	January, May, and June.	Palos	April to June, inclusive.
Essex	January to May, inclusive.	Ranger	February to June, inclusive.
Franklin	January and June.	Richmond	Do.
Frolic	March to June, inclusive.	Rio Bravo	January to June, inclusive.
Gettysburg	February to June, inclusive.	Santee	Do.
Hartford	January to June, inclusive.	Saratoga	June.
Huron	Do.	St. Louis	January to June, inclusive.
Intrepid	January.	Swatara	Jan., and Mar. to June, inclusive.
Kearsarge	April and June.	Tallapoosa	January.
Lackawanna	February to June, inclusive.	Tennessee	March to June, inclusive.
Lehigh	January.	Trenton	May and June.
Minnesota	Do.	Vandalia	February to June, inclusive.
Manhattan	Do.	Wabash	January to June, inclusive.
Marion	February to June, inclusive.	Wyoming	Do.

UNITED STATES NAVAL STATIONS.

Naval hospital	Annapolis, Md	January to June, inclusive.
Do	Yokohama, Japan	April to June, inclusive.
Navy-yard	Norfolk, Va	January to May, inclusive.
Do	Pensacola, Fla	January to June, inclusive.
Do	Portsmouth, N. H	Do.
Do	Washington, D. C	January.

Monthly and annual mean pressure—July, 1876, to June, 1877. (Reduced to sea-level.)

Stations.	1876.						1877.						Annual mean.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Albany N. Y	29.935	30.020	29.964	29.943	29.960	29.953	30.107	30.020	29.965	29.971	29.944	29.933	29.976
Alpena, Mich	29.919	29.979	29.983	29.867	29.937	29.949	30.051	30.116	30.025	30.044	30.035	29.985	29.982
Atlantic City, N. J	29.997	30.058	29.972	30.012	29.949	30.010	30.155	30.063	29.981	29.973	29.997	30.006	30.015
Augusta, Ga	30.042	30.046	29.975	30.065	30.025	30.142	30.207	30.152	30.059	29.953	30.032	30.045	30.062
Baltimore, Md	30.017	30.077	29.994	30.041	29.987	30.060	30.176	30.104	30.008	29.985	30.029	30.001	30.040
Barnegat, N. J	29.984	30.048	29.967	29.998	29.941	29.994	30.138	30.051	29.980	29.969	29.980	29.995	30.004
Bismarck, Dak	29.666	29.704	29.894	29.765	30.008	30.063	30.050	30.068	29.982	29.881	29.659	29.668	29.867
Boston, Mass	29.944	30.042	29.977	29.925	29.933	29.900	30.064	29.966	29.957	29.965	29.920	29.957	29.962
Breckenridge, Minn	29.834	29.843	29.998	29.872	30.068	30.190	30.152	30.184	30.004	29.966	29.826	29.771	29.925
Buffalo, N. Y	29.939	30.008	29.932	29.906	29.927	29.957	30.084	30.088	29.965	29.980	29.997	29.900	29.974
Burlington, Vt	29.923	30.019	29.958	29.889	29.973	29.942	30.086	30.011	29.975	30.006	29.947	29.927	29.971
Cairo, Ill	30.005	30.022	30.010	30.041	30.071	30.190	30.217	30.200	30.054	29.896	29.997	29.960	30.055
Cape Hatteras, N. C	29.994	29.998	29.913	29.964	29.897	30.005	30.113	30.029	29.961	29.887	29.967	29.988	29.976
Cape Henry, Va	30.007	30.018	29.951	30.030	29.954	30.057	30.170	30.096	29.998	29.945	30.021	30.023	30.022
Cape Lookout, N. C	30.070	30.071	*a*	30.040	29.977	30.087	30.192	30.107	30.034	29.949	30.044	30.061	30.057
Cape May, N. J	30.002	30.058	29.965	30.015	29.959	30.019	30.148	30.072	29.988	29.964	30.001	30.005	30.016
Charleston, S. C	30.068	30.065	29.982	30.052	30.016	30.122	30.200	30.133	30.066	29.974	30.044	30.064	30.065
Cheyenne, Wyo	30.035	30.027	30.052	29.944	29.453	29.894	29.898	30.007	29.834	29.858	29.824	29.959	29.940
Chicago, Ill	29.941	29.978	29.957	29.906	29.960	30.078	30.118	30.145	30.022	29.927	29.984	29.865	29.990
Cincinnati, Ohio	29.940	29.972	29.919	29.959	29.950	30.064	30.129	30.114	29.971	29.889	*b*29.961	29.894	29.978
Cleveland, Ohio	29.982	30.034	29.965	29.962	29.967	30.046	30.134	30.140	30.015	29.982	30.032	29.934	30.016
Corsicana, Tex	29.963	29.945	30.002	29.986	30.066	30.181	30.212	30.183	30.016	29.879	29.913	29.934	30.025
Davenport, Iowa	29.952	29.988	29.983	29.937	30.031	30.171	30.190	30.203	30.075	29.942	29.974	29.882	30.097
Denver, Colo	30.033	30.056	30.090	29.996	30.032	29.991	29.990	30.076	29.897	29.899	29.853	29.978	29.992
Detroit, Mich	29.945	30.002	29.952	29.917	29.935	30.015	30.097	30.116	29.997	29.959	30.001	29.883	29.985
Dodge City, Kans	29.517	29.518	29.609	29.619	29.778	29.900	29.892	29.908	29.638	29.540	29.425	29.475	29.652
Dubuque, Iowa	29.933	29.961	29.971	29.903	30.006	30.148	30.155	30.169	30.055	29.937	29.945	29.847	30.002
Duluth, Minn	29.899	29.911	29.994	29.842	29.991	30.104	30.066	30.141	30.040	30.015	29.955	29.828	29.982
Eastport, Me	29.910	29.992	29.956	29.827	29.914	29.791	29.981	29.877	29.953	29.952	29.862	29.924	29.912
Erie, Pa	29.948	30.009	29.931	29.927	29.930	29.986	30.088	30.101	29.970	29.945	29.994	29.901	29.978
Escanaba, Mich	29.941	29.965	29.986	29.852	29.948	30.024	30.017	30.115	30.034	30.024	29.996	29.844	29.981
Fort Gibson, Ind. T	29.925	29.905	29.952	29.960	30.050	30.166	30.173	30.169	29.976	29.850	29.875	29.883	29.990
Fort Sully, Dak	29.746	29.756	29.944	*c*	*c*	30.170	30.156	30.151	30.038	29.911	29.717	29.747	*d*29.934
Galveston, Tex	30.035	30.006	30.032	30.048	30.092	30.175	30.222	30.179	30.180	29.919	29.978	30.013	30.073
Grand Haven, Mich	29.948	29.993	29.967	29.887	29.934	30.030	30.076	30.130	30.016	29.957	29.997	29.873	29.984
Indianapolis, Ind	29.957	30.001	29.954	29.972	29.990	30.109	30.160	30.156	30.013	29.898	29.992	29.907	30.009
Indianola, Tex	30.024	29.995	30.028	30.049	30.089	30.171	30.225	30.192	30.067	29.914	29.950	29.989	30.056

a Ten days' observations not taken on account of storm of September 17 breaking all thermometers. *b* Mean for thirty days. *c* No means; sergeant absent from station.
d Mean for ten months.

Monthly and annual mean pressure—July, 1876, to June, 1877, &c.—Continued.

Stations.	1876.						1877.						Annual mean.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Jacksonville, Fla	30.066	30.057	29.981	30.030	30.033	30.135	30.206	30.118	30.086	29.974	30.016	30.066	30.064
Keokuk, Iowa	29.909	29.930	29.936	29.915	30.002	30.141	30.142	30.159	30.014	29.864	29.913	29.806	29.969
Key West, Fla	30.080	30.052	29.991	29.932	30.010	30.114	30.172	30.077	30.085	29.995	29.960	30.043	30.043
Kittyhawk, N. C	30.048	30.069	29.984	30.049	29.974	30.070	30.174	30.101	30.017	29.958	30.041	30.041	30.044
Knoxville, Tenn	30.029	30.033	29.983	30.056	30.036	30.156	30.213	30.157	30.049	29.917	30.012	30.007	30.054
La Crosse, Wis	29.917	29.945	29.972	29.874	29.999	30.150	30.129	30.167	30.051	29.949	29.920	29.824	29.991
Leavenworth, Kans	29.893	29.906	29.954	29.925	30.051	30.179	30.175	30.192	30.003	29.838	29.866	29.828	29.984
Louisville, Ky	29.981	30.011	29.968	30.010	30.012	30.129	30.179	30.168	30.018	29.900	30.000	29.940	30.026
Lynchburg, Va	29.995	30.035	29.956	30.025	29.968	30.077	30.179	30.105	29.994	29.946	30.017	29.986	30.024
Malone, N. Y	29.889	29.977	29.919	29.837	29.929	29.908	30.036	29.980	29.894	29.961	*a*	*a*	*a*
Marquette, Mich	29.915	29.944	29.992	29.828	29.945	29.986	30.003	30.104	30.020	30.027	29.975	*b*29.824	29.964
Memphis, Tenn	30.018	30.024	30.024	30.059	30.089	30.204	30.226	30.198	30.059	29.914	29.993	29.986	30.066
Milwaukee, Wis	29.970	30.010	29.995	29.909	29.983	30.099	30.127	30.172	30.066	29.994	30.027	29.895	30.021
Mobile, Ala	30.053	30.041	30.005	30.058	30.076	30.165	30.220	30.155	30.091	29.951	30.019	30.053	30.074
Montgomery, Ala	30.055	30.053	30.005	30.076	30.080	30.182	30.230	30.165	30.089	29.952	30.022	30.043	30.079
Morgantown, W. Va	29.986	30.023	29.950	29.994	29.967	30.052	30.151	30.124	29.991	29.932	30.000	29.939	30.009
Mount Washington, N. H	30.244	30.308	30.133	29.893	29.904	29.586	29.692	29.788	29.782	30.001	30.060	30.187	29.956
Nashville, Tenn	29.996	30.008	29.976	30.029	30.039	30.154	30.197	30.166	30.050	29.904	30.005	29.986	30.042
New Haven, Conn	29.963	30.053	29.975	29.968	29.943	29.952	30.114	30.016	29.976	29.970	29.953	29.982	29.989
New London, Conn	29.981	30.066	29.991	29.968	29.945	29.950	30.110	30.014	29.973	29.963	29.957	30.000	29.994
New Orleans, La	30.037	30.021	30.009	30.048	30.071	30.155	30.208	30.149	30.077	29.926	29.995	30.030	30.060
Newport, R. I	29.969	30.056	29.983	29.956	29.932	29.928	30.091	29.993	29.967	29.962	29.941	29.986	29.980
New York, N. Y	29.984	30.066	29.992	30.001	29.958	29.993	30.144	30.059	29.993	29.991	29.988	29.991	30.013
Norfolk, Va	30.036	30.061	29.973	30.045	29.972	30.071	30.177	30.111	30.013	29.964	30.043	30.028	30.041
North Platte, Nebr	29.454	29.474	29.615	29.568	29.737	29.828	29.847	29.850	29.636	29.523	29.396	29.448	29.616
Omaha, Nebr	29.882	29.894	29.962	29.902	30.036	30.167	30.149	30.163	29.995	29.861	29.821	29.785	29.968
Oswego, N. Y	29.966	30.041	29.974	29.938	29.964	29.979	30.104	30.078	29.982	30.015	30.008	29.942	29.999
Pembina, Dak	29.801	29.808	29.976	29.847	30.048	30.164	30.089	30.132	30.079	29.998	29.824	29.796	29.968
Philadelphia, Pa	29.993	30.061	29.984	30.020	29.969	30.027	30.163	30.084	30.001	29.983	29.997	29.997	30.023
Pike's Peak, Colo	30.276	30.230	30.170	29.994	29.878	29.766	29.769	29.875	29.804	29.763	29.885	30.093	29.959
Pittsburgh, Pa	29.966	30.016	29.935	29.973	29.952	30.027	30.125	30.107	29.972	29.935	29.987	29.920	29.993
Port Huron, Mich	29.950	30.012	29.954	29.908	29.933	30.001	30.087	30.107	29.995	29.983	30.009	29.869	29.986
Portland, Me	29.948	30.027	29.974	29.870	29.941	29.863	30.029	29.925	29.939	29.964	29.901	29.934	29.945
Portland, Oreg	30.059	30.072	30.033	29.966	30.133	30.194	30.102	30.099	30.016	30.128	30.031	30.111	30.079
Punta Rassa, Fla	30.085	30.056	29.999	29.981	30.039	30.131	30.200	30.097	30.102	30.002	*e*29.973	*c*30.015	30.061
Rochester, N. Y	29.939	30.010	29.941	29.905	29.937	29.958	30.079	30.092	29.956	29.969	29.981	29.903	29.972
Salt Lake City, Utah	29.921	29.923	29.950	29.945	30.079	30.084	30.071	30.076	29.894	29.834	29.791	29.927	29.958
Sandy Hook, N. J	29.970	30.046	29.970	29.964	29.916	29.950	30.099	30.041	29.969	29.963	29.986	29.996	29.992
San Diego, Cal	29.953	29.944	29.945	29.993	30.030	30.066	30.105	30.056	30.041	30.015	29.980	29.955	30.007
San Francisco, Cal	29.939	29.916	29.936	29.998	30.094	30.104	30.080	30.093	30.027	30.010	29.933	29 949	30.007
Santa Fé, N. Mex	29.910	29.894	29.895	29.818	29.815	29.755	29.783	29.814	*d*29.735	29.674	29.711	29.840	29.804
Savannah, Ga	30.064	30.066	29.988	*d*30.062	30.030	30.144	30.218	30.138	30.071	29.965	30.040	30.068	30.071

Shreveport, La	30.047	30.035	30.052	30.077	30.134	30.263	30.261	30.227	30.083	29.937	30.036	30.042	30.100
Smithville, N. C	30.075	30.070	29.979	30.048	29.998	30.168	30.201	30.118	30.051	29.964	30.053	30.067	30.061
Springfield, Mass	29.953	c30.019	29.974	29.945	29.941	29.940	30.100	30.009	29.979	29.983	29.948	29.964	29.980
Saint Louis, Mo	29.976	29.998	29.996	30.000	30.057	30.180	30.198	30.200	30.018	29.895	e29.975	29.911	30.036
Saint Mark's, Fla	30.062	30.052	29.989	30.043	30.056	30.151	30.225	30.129	30.087	29.970	30.005	30.060	30.069
Saint Michael's, Alaska	29.808	29.825	29.875	29.865	30.145	29.749	29.908	30.103	29.880	29.704	29.584	29.821	29.822
Saint Paul, Minn	g	29.885	29.948	29.830	f29.971	30.115	30.092	30.120	30.021	29.921	29.860	29.775	29.958
Thatcher's Island, Mass	29.951	30.042	29.982	29.916	29.941	29.899	30.059	29.968	29.959	29.973	29.921	29.967	29.965
Toledo, Ohio	29.932	29.991	29.938	29.916	29.932	30.021	30.103	h30.124	30.005	29.959	30.008	29.896	29.985
Tybee Island, Ga	30.058	30.053	29.975	30.033	k30.038	i30.098	30.198	30.113	30.055	29.949	30.020	30.053	30.054
Vicksburg, Miss	30.045	30.038	30.049	30.083	30.120	30.220	30.257	30.210	30.096	29.939	30.012	30.031	30.092
Virginia City, Mont	29.760	29.747	29.796	29.705	29.753	29.747	29.723	29.778	29.603	29.647	29.604	29.720	29.715
Washington, D. C	30.011	30.066	29.983	30.042	29.987	30.066	30.181	30.112	30.011	29.984	30.026	30.001	30.039
Wilmington, N. C	30.064	30.065	29.975	30.045	29.991	30.102	30.193	30.115	30.036	29.956	30.037	30.049	30.052
Wood's Holl, Mass	29.986	30.069	30.002	29.965	29.937	29.928	30.099	29.997	29.979	29.970	29.957	30.013	29.992
Yankton, Dak	29.867	29.893	30.017	29.937	30.112	30.240	30.210	30.224	30.091	29.958	29.854	29.819	30.020

a Station discontinued April 30, 1877. *b* Mean of twenty-three days. *c* Mean of twenty-six days. *d* Mean of twenty-nine days. *e* Mean of thirty days.
f Mean of twenty-eight days. *g* No means; observer sick. *h* Mean of twenty-seven days. *i* Mean of twenty days. *k* Mean of twenty-three days.

PAPER 17.

Monthly and annual mean temperature—July, 1876, to June, 1877.

Stations.	1876.						1877.						Annual means.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
Albany, N. Y.	73.9	72.9	59.2	46.6	40.3	18.3	17.1	29.2	30.5	46.6	57.9	68.2	46.7
Alpena, Mich	67.3	67.1	55.1	40.5	34.8	15.5	15.8	28.2	20.1	38.6	51.0	60.5	41.2
Atlantic City, N. J.	73.0	73.4	65.0	51.4	44.9	27.3	29.4	35.2	37.2	46.2	56.7	65.9	50.5
Augusta, Ga	82.7	81.6	75.2	60.1	52.4	39.1	48.4	49.5	56.0	64.1	70.2	78.8	63.2
Baltimore, Md.	80.4	75.9	65.6	52.4	47.1	28.7	32.1	40.5	41.4	53.6	62.7	73.7	54.5
Barnegat, N. J	74.3	73.3	64.5	50.6	45.5	27.0	28.6	34.8	37.1	45.6	56.3	65.5	50.3
Bismarck, Dak	70.3	68.0	53.7	40.7	18.3	6.8	6.3	26.5	19.0	40.4	56.9	59.0	38.8
Boston, Mass.	73.1	69.5	58.9	48.0	40.8	22.3	24.2	33.6	35.1	44.3	54.9	66.5	47.6
Breckenridge, Minn	70.9	67.6	53.8	38.1	18.7	—0.1	—0.9	21.5	15.2	40.5	58.4	58.9	37.0
Buffalo, N. Y	71.3	72.6	59.0	46.1	39.6	19.7	20.4	29.8	27.7	43.6	53.9	65.3	45.7
Burlington, Vt	73.0	71.9	58.1	46.3	37.4	17.6	16.8	29.8	30.7	45.3	56.4	67.9	45.9
Cairo, Ill	79.9	77.5	68.6	56.1	43.8	27.5	34.3	43.6	44.1	57.7	65.7	75.1	56.2
Cape Hatteras, N. C	79.2	78.2	73.1	61.3	53.7	40.2	43.6	45.8	51.2	55.2	60.7	74.9	59.8
Cape Henry, Va	79.4	77.1	70.4	57.7	50.6	34.8	37.6	42.4	45.9	53.2	61.0	73.0	56.9
Cape Lookout, N. C.	80.4	79.6	*a*	62.7	55.1	40.3	44.7	47.1	52.2	58.3	63.9	76.0	55.0
Cape May, N. J	75.0	76.2	67.3	55.6	48.3	30.1	32.0	37.4	39.0	47.8	58.6	69.5	53.1
Charleston, S. C	83.6	82.4	77.9	62.4	56.3	44.1	51.2	51.7	56.8	63.0	68.8	80.2	64.9
Cheyenne, Wyo	72.3	66.5	57.3	46.9	33.2	23.4	25.0	31.6	35.9	38.2	50.2	59.0	45.0
Chicago, Ill.	73.2	73.7	61.5	49.4	39.2	19.9	22.2	36.7	29.5	45.7	56.8	65.8	47.8
Cincinnati, Ohio	79.4	77.0	66.8	52.8	44.2	25.6	31.4	41.3	39.4	55.7	*b*63.3	73.9	54.2
Cleveland, Ohio	72.9	70.5	60.2	47.8	40.4	21.0	23.2	33.5	29.3	44.8	57.4	67.9	47.4
Corsicana, Tex	83.6	82.9	74.8	66.6	52.4	41.6	43.0	51.3	58.1	63.5	71.3	78.7	64.0
Davenport, Iowa	75.9	74.9	62.5	49.3	35.3	15.6	17.2	36.1	28.7	49.8	62.2	69.2	48.1
Denver, Colo	76.4	70.1	61.5	51.7	37.1	27.2	24.1	34.5	42.8	44.2	56.5	65.1	49.3
Detroit, Mich	73.0	72.1	59.1	46.2	38.6	18.5	20.3	33.2	26.7	46.0	57.7	67.2	46.5
Dodge City, Kans.	79.6	77.2	66.7	52.6	38.4	22.8	23.9	37.1	42.6	50.1	62.7	70.6	52.0
Dubuque, Iowa	75.5	74.2	61.6	48.1	34.5	13.8	15.9	35.1	27.5	48.5	62.6	67.7	47.1
Duluth, Minn	64.9	65.5	55.5	41.7	31.3	10.0	11.8	32.2	22.6	40.3	50.7	56.6	40.3
Eastport, Me.	61.7	61.3	53.8	45.1	38.3	21.6	18.5	27.9	29.8	41.1	47.7	57.7	41.9
Erie, Pa	74.2	72.6	60.6	47.8	41.8	22.4	23.9	32.6	30.0	44.2	56.4	66.9	47.8
Escanaba, Mich	68.1	67.9	55.2	39.7	33.4	14.6	11.6	26.7	18.3	36.9	51.7	58.5	40.2
Fort Gibson, Ind. T.	81.0	81.4	71.8	58.4	44.8	29.9	33.7	44.8	49.2	57.9	68.2	75.3	58.0
Fort Sully, Dak	75.6	73.1	58.6	*c*	*c*	13.7	13.9	33.4	23.8	44.7	58.6	63.6	*d*45.9
Galveston, Tex.	85.0	83.7	79.4	71.6	60.1	50.2	50.7	56.2	62.1	68.8	74.8	81.5	68.7
Grand Haven, Mich	71.1	70.5	58.6	47.1	39.0	21.9	24.2	32.6	28.0	45.4	57.0	63.4	46.6
Indianapolis, Ind.	78.0	75.1	64.6	51.7	41.3	22.6	28.1	39.5	35.5	54.1	62.2	71.7	52.0
Indianola, Tex	84.3	83.3	79.4	71.6	59.0	49.7	49.6	57.0	63.6	70.1	75.3	81.0	68.7
Jacksonville, Fla.	83.4	82.6	79.4	66.0	59.1	49.0	56.4	55.6	60.8	68.2	72.8	81.7	67.9
Keokuk, Iowa	76.5	76.2	64.4	52.2	36.0	19.0	22.5	38.4	32.6	51.0	62.3	71.7	50.2
Key West, Fla	82.3	82.7	84.4	79.4	73.3	66.6	71.1	68.0	71.0	75.9	78.2	83.0	76.4
Kittyhawk, N. C.	79.8	78.3	71.8	58.7	51.3	36.9	39.6	42.6	47.1	53.2	59.8	73.7	57.7
Knoxville, Tenn	76.4	76.2	66.5	53.8	43.9	29.2	34.8	43.7	45.2	56.8	63.8	73.0	55.3
La Crosse, Wis	74.8	72.1	59.9	47.3	33.8	10.9	13.7	34.2	26.4	48.0	63.4	66.2	45.9
Leavenworth, Kans	78.9	78.2	66.0	53.7	37.6	23.3	24.6	39.5	38.4	53.3	63.8	71.9	52.4
Louisville, Ky.	79.2	77.6	67.5	53.6	44.0	26.8	32.6	41.2	43.3	56.8	64.1	74.6	55.0
Lynchburg, Va.	81.5	76.6	67.9	53.9	47.3	30.2	34.2	43.6	46.5	56.2	63.1	77.1	56.5
Malone, N. Y	70.0	69.9	55.9	44.4	36.4	14.9	16.5	29.0	29.3	45.1	*e*	*e*	*e*
Marquette, Mich	66.9	68.1	54.8	40.2	34.8	17.6	17.3	31.4	21.5	39.6	54.1	*f*58.8	42.1
Memphis, Tenn	81.3	79.1	70.0	58.5	48.1	32.6	39.3	46.7	50.0	59.3	70.5	77.8	59.4
Milwaukee, Wis.	70.3	69.7	58.5	44.9	34.9	14.2	15.4	32.4	23.5	40.7	52.8	60.4	43.1
Mobile, Ala	83.3	80.1	76.8	64.4	55.7	44.4	50.1	53.4	57.5	65.9	72.8	80.8	65.4
Montgomery, Ala	82.8	80.9	75.1	62.9	53.2	41.8	49.5	52.3	55.3	64.4	72.0	80.8	64.2
Morgantown, W. Va	75.0	72.9	62.3	49.7	42.3	24.8	30.3	37.5	37.4	51.6	59.2	72.2	51.3
Mount Washington, N. H.	49.4	48.6	37.8	23.9	21.5	0.6	1.1	10.8	11.5	24.1	32.4	41.8	25.5
Nashville, Tenn	80.9	78.7	69.2	56.7	46.4	30.8	37.0	45.0	47.4	59.2	67.3	77.0	58.0
New Haven, Conn.	77.2	72.4	61.3	51.0	44.2	25.9	28.3	35.9	38.0	48.4	59.5	69.5	51.0
New London, Conn.	74.3	70.5	61.3	50.3	44.0	25.5	26.9	34.3	36.9	47.1	56.6	65.7	49.4
New Orleans, La	81.4	82.2	79.1	67.6	59.2	48.1	53.7	55.9	60.7	68.6	73.5	81.3	67.8
Newport, R. I	73.4	70.5	61.3	50.8	43.8	26.4	27.0	33.8	36.4	45.4	54.0	65.0	49.0
New York, N. Y	77.2	73.4	63.5	50.3	44.9	25.5	27.6	36.0	36.6	48.0	58.9	69.1	50.9
Norfolk, Va	81.7	78.2	69.7	56.8	49.4	33.6	39.0	43.5	47.4	55.0	63.1	75.5	57.7
North Platte, Nebr	76.3	72.8	60.1	47.9	36.4	21.2	17.4	34.1	32.7	45.4	57.9	66.2	47.4
Omaha, Nebr.	75.1	75.4	60.0	50.3	33.2	19.2	20.2	37.3	33.7	50.5	60.7	69.1	48.7
Oswego, N. Y	70.4	71.9	59.4	47.3	41.3	22.0	22.3	31.7	30.6	43.5	53.6	64.7	46.6
Pembina, Dak.	67.4	63.7	51.9	37.1	15.4	—6.3	—5.2	17.4	8.3	33.1	56.8	55.7	32.9
Philadelphia, Pa	78.6	74.3	63.8	50.8	45.0	25.5	28.4	36.9	38.2	50.0	60.7	71.7	52.0
Pike's Peak, Colo.	42.0	36.5	31.7	21.4	11.0	4.9	5.4	7.7	12.1	9.6	18.3	28.1	19.2
Pittsburgh, Pa	76.1	73.7	62.3	49.1	42.4	23.6	28.1	36.9	35.7	51.7	60.1	72.1	51.0

a Ten days' observations not taken on account of storm of September 17 breaking all thermometers.
b Mean of thirty days. *c* Observer absent. *d* Mean of ten months.
e Station discontinued April 30, 1877. *f* Mean of twenty-three days.

Monthly and annual mean temperature, &c.—Continued.

Stations.	1876.						1877.						Annual means.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
Port Huron, Mich..	69.4	70.2	57.4	44.4	37.7	17.9	19.1	30.6	24.7	39.9	52.2	63.2	43.9
Portland, Me.....	71.6	69.4	58.3	47.1	41.2	21.5	20.1	32.7	34.0	45.3	55.6	65.0	46.9
Portland, Oreg.....	66.5	64.1	62.9	57.6	45.8	40.2	42.0	46.2	49.9	52.6	56.7	62.9	53.9
Punta Rassa, Fla...	80.6	81.6	81.1	75.0	66.9	60.2	65.8	64.8	67.1	71.3	c75.7	a81.6	72.6
Rochester, N. Y....	71.8	72.4	57.9	45.7	40.1	19.7	21.0	31.2	28.9	45.5	57.1	66.8	46.5
Salt Lake City, Utah	76.9	72.6	65.6	54.6	40.5	26.6	27.9	33.7	48.0	48.6	56.7	65.9	51.4
San Diego, Cal.....	68.6	69.1	65.9	64.2	58.9	56.5	56.9	57.8	59.3	58.3	60.4	66.9	61.9
Sandy Hook, N. J..	77.7	74.2	63.9	51.3	45.9	27.3	28.7	36.2	37.4	47.2	59.2	69.2	51.5
San Francisco, Cal..	58.8	58.8	60.6	59.2	57.8	53.0	54.1	55.4	56.3	54.1	55.3	61.6	57.1
Santa Fé, N. Mex...	69.2	65.2	60.2	48.6	35.7	28.5	31.7	33.3	b44.4	42.3	54.4	66.6	48.3
Savannah, Ga	84.5	82.1	78.0	b81.6	56.4	44.9	54.1	52.5	58.5	65.1	70.0	81.3	66.6
Shreveport, La.....	83.6	83.1	75.3	64.4	53.1	41.3	44.1	52.1	58.3	65.0	73.6	80.2	64.5
Smithville, N. C....	81.6	80.7	75.5	61.1	54.0	40.0	45.4	47.8	53.0	59.7	65.4	76.4	61.7
Springfield, Mass..	76.4	c72.5	61.1	48.9	42.7	23.9	23.9	34.2	35.9	49.4	60.1	69.7	49.9
Saint Louis, Mo	79.2	77.8	66.8	55.7	40.6	25.1	31.5	41.7	38.6	54.6	c63.7	74.6	54.2
Saint Mark's, Fla...	81.4	80.3	76.6	62.8	54.9	44.9	52.3	53.8	57.7	64.8	71.5	78.9	65.0
Saint Michael's, Alaska.	32.7	49.2	44.4	30.3	6.9	3.4	1.6	—23.8	12.7	28.8	37.4	52.2	24.7
Saint Paul, Minn...	d	69.9	56.8	43.2	f29.6	8.4	10.0	32.0	23.7	46.2	62.0	63.7	e40.5
Thatcher's Island, Mass.	68.3	66.8	58.3	47.8	42.1	25.1	25.0	32.3	34.7	43.0	52.6	62.1	46.5
Toledo, Ohio	75.4	73.2	60.8	48.8	41.3	23.1	27.1	g37.1	31.0	48.1	60.2	70.2	49.7
Tybee Island, Ga...	82.1	80.9	77.1	62.4	h58.3	i45.1	49.3	50.4	56.0	62.3	68.4	77.7	64.2
Vicksburg, Miss ...	82.6	80.2	74.0	63.2	52.3	41.2	45.6	51.8	57.2	64.1	72.9	79.4	63.7
Virginia City, Mont	64.5	58.5	53.5	44.9	30.9	24.4	18.8	27.5	33.2	36.5	44.0	52.8	40.8
Washington, D. C ..	80.3	75.3	65.3	51.4	45.6	30.0	30.0	39.7	41.3	53.0	62.1	73.7	54.0
Wilmington, N. C..	79.8	78.3	73.7	59.6	53.0	39.1	46.1	48.1	53.4	60.1	64.5	76.5	61.0
Wood's Holl, Mass.	71.9	69.5	61.9	51.7	44.8	28.0	28.1	33.7	36.6	44.6	52.9	63.8	49.0
Yankton, Dak.....	73.3	72.0	58.1	45.4	27.1	12.2	13.6	36.4	28.5	45.8	58.8	65.0	44.6

a Mean of twenty-six days. *b* Mean of twenty-nine days. *c* Mean of thirty days.
d No means; observer sick. *e* Mean of eleven months. *f* Mean of twenty-eight days.
g Mean of twenty-seven days. *h* Mean of twenty-three days. *i* Mean of twenty days.

PAPER 18.

Monthly and annual amounts of rain-fall, in inches, from July, 1876, to June, 1877.

Stations.	1876.						1877.						Annual amounts.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Albany, N. Y	4.97	0.53	5.17	1.64	2.65	2.42	1.95	0.36	3.33	1.42	2.77	4.60	31.81
Alpena, Mich	4.02	4.67	0.36	2.61	3.03	2.16	1.41	0.48	1.97	1.21	0.64	3.25	25.81
Atlantic City, N. J	0.92	2.23	6.61	0.78	6.52	2.01	1.92	0.87	4.89	2.51	1.58	2.35	33.19
Augusta, Ga	6.26	3.68	2.56	3.18	3.54	5.17	4.76	4.30	5.98	5.63	1.18	6.67	50.89
Baltimore, Md	5.64	1.76	10.52	2.79	2.74	1.32	3.80	1.87	3.60	3.30	2.23	3.53	43.10
Barnegat, N. J	2.20	1.53	6.81	1.53	7.71	3.35	4.82	1.52	6.72	2.53	1.36	3.09	43.17
Bismarck, Dak	1.48	6.55	5.61	0.30	0.86	0.87	1.64	0.19	0.77	1.32	4.15	4.60	28.34
Boston, Mass	5.86	1.23	3.84	1.66	11.03	3.71	3.33	0.45	9.79	4.19	3.38	3.21	51.68
Breckenridge, Minn	2.34	5.84	2.26	1.10	0.02	0.06	0.03	0.01	0.30	2.08	2.81	7.44	24.29
Buffalo, N. Y	4.77	0.05	4.35	8.56	4.47	3.35	2.19	0.46	4.91	2.24	0.53	4.86	35.64
Burlington, Vt	2.49	2.66	4.82	0.92	1.51	1.52	1.43	0.32	2.52	2.53	0.95	3.11	24.78
Cairo, Ill	3.44	5.24	0.73	2.14	0.96	0.73	1.93	0.25	3.62	3.87	2.13	4.88	29.92
Cape Hatteras, N. C	4.72	5.54	11.69	8.28	5.10	9.39	5.90	5.85	10.41	11.07	3.07	8.42	89.44
Cape Henry, Va	8.78	3.07	14.90	2.11	4.72	2.93	5.59	1.06	6.29	6.89	2.88	4.61	63.83
Cape Lookout, N. C	3.92	7.67	(*)	8.48	3.17	6.15	4.56	3.69	7.39	10.65	5.57	9.69	70.94
Cape May, N. J	2.84	1.29	9.56	1.31	4.94	2.69	2.13	1.95	7.65	3.27	2.42	3.77	43.82
Charleston, S. C	11.26	5.10	11.28	14.32	1.35	5.85	4.44	2.96	7.86	15.00	2.71	10.31	92.42
Cheyenne, Wyo	0.79	0.26	0.00	0.00	0.32	0.21	0.20	0.14	0.98	1.11	2.24	1.27	7.52
Chicago, Ill	3.11	3.66	3.74	1.20	3.25	0.48	1.91	0.06	5.37	2.42	1.81	6.04	33.05
Cincinnati, Ohio	6.91	6.38	3.17	4.26	2.36	0.88	2.33	0.67	5.47	2.32	1.76	5.24	41.75
Cleveland, Ohio	3.04	4.03	5.83	3.47	2.56	2.16	2.08	0.18	6.34	2.28	0.67	5.43	38.07
Corsicana, Tex	3.27	1.58	1.58	0.68	3.84	2.22	1.06	6.84	4.81	6.01	4.75	4.76	41.40
Davenport, Iowa	4.82	4.27	5.50	1.54	2.54	0.36	1.41	0.07	3.91	3.28	2.82	5.80	36.32
Denver, Colo	1.16	2.03	0.60	0.12	1.50	1.70	1.90	0.40	1.40	2.77	2.30	1.93	17.81
Detroit, Mich	5.94	2.46	2.81	2.89	2.32	1.96	1.23	0.04	5.43	3.27	0.90	4.80	34.05
Dodge City, Kans	2.26	1.03	2.13	1.00	1.35	0.15	0.18	0.56	0.25	3.38	4.96	3.92	21.17
Dubuque, Iowa	8.15	5.92	5.90	1.10	2.49	0.52	0.96	0.26	4.53	3.74	3.84	6.75	44.16
Duluth, Minn	4.03	3.92	4.21	2.15	2.79	0.87	1.45	0.10	0.79	1.20	7.24	4.89	33.64
Eastport, Me	2.82	2.62	6.53	4.28	7.97	5.13	3.42	1.34	8.83	5.47	2.60	2.19	53.20
Erie, Pa	1.31	0.98	8.45	5.45	2.92	0.75	2.15	0.33	5.07	2.04	1.39	5.92	36.67
Escanaba, Mich	5.05	3.43	2.24	3.43	2.70	0.57	0.65	0.30	1.03	1.40	0.63	5.55	26.98
Fort Gibson, Ind. T	6.06	0.94	2.43	1.10	2.89	0.20	0.29	1.47	2.27	7.77	4.82	7.74	37.98
Fort Sully, Dak	1.99	4.14	4.09	(†)	(†)	0.56	1.01	0.03	2.52	4.14	4.02	1.76	24.26
Galveston, Tex	3.22	10.19	0.64	1.41	3.98	3.71	4.53	1.12	1.35	8.36	1.80	2.68	42.99
Grand Haven, Mich	3.51	1.82	6.24	2.28	5.26	1.16	1.53	0.09	3.15	4.48	2.10	4.12	35.80
Indianapolis, Ind	7.48	5.86	3.85	4.42	2.26	0.90	1.56	1.21	5.23	3.11	2.09	6.21	44.18
Indianola, Tex	3.17	4.60	3.51	4.64	2.76	2.48	0.91	1.58	2.74	1.64	2.20	4.81	35.04
Jacksonville, Fla	2.62	8.07	3.73	8.92	2.60	6.15	2.65	1.09	2.53	3.01	2.48	9.47	53.52
Keokuk, Iowa	6.79	4.03	11.08	2.12	2.82	0.23	0.84	0.15	3.76	4.22	5.55	7.82	49.41
Key West, Fla	5.48	4.38	3.13	9.27	2.50	0.72	0.91	2.61	1.17	0.46	4.53	3.92	39.08
Kittyhawk, N. C	3.98	2.90	13.79	3.55	4.14	4.04	4.65	3.06	7.62	7.83	1.42	10.97	67.95
Knoxville, Tenn	3.93	1.87	1.60	1.81	2.36	1.74	7.49	1.15	6.65	8.79	1.64	4.50	43.53
La Crosse, Wis	1.85	5.97	4.17	0.57	2.24	1.11	1.54	0.11	2.87	3.63	2.94	3.34	30.34
Leavenworth, Kans	4.01	3.40	3.56	2.79	2.87	0.31	0.73	0.50	4.39	7.14	8.67	10.00	48.37
Louisville, Ky	2.61	4.29	2.66	7.61	1.63	1.24	3.95	0.44	4.93	5.31	3.98	5.57	45.22
Lynchburg, Va	2.30	4.82	7.85	1.44	2.50	1.38	4.51	0.42	2.49	4.02	2.01	1.13	34.87
Malone, N. Y	3.40	0.56	4.82	3.69	3.27	3.79	4.58	1.12	4.29	3.63	(§)	.....	.....
Marquette, Mich	3.07	1.95	4.22	2.81	2.32	0.82	0.29	0.12	0.35	1.63	0.84	‖3.31	21.72
Memphis, Tenn	4.38	5.37	3.04	3.95	0.90	2.14	4.31	1.54	4.24	13.90	1.81	18.16	63.74
Milwaukee, Wis	4.39	5.52	3.66	1.62	3.57	2.16	2.83	0.10	5.53	6.99	0.74	5.76	42.87
Mobile, Ala	5.38	11.53	1.76	0.37	5.36	7.18	6.30	1.40	5.94	8.40	1.68	7.07	62.37
Montgomery, Ala	6.24	3.05	1.61	0.96	3.42	5.97	6.67	2.64	7.17	10.36	0.82	2.94	51.89
Morgantown, W. Va	9.35	3.77	7.16	1.63	2.17	1.95	4.26	1.09	3.98	2.51	2.25	6.70	46.82
Mount Washington, N. H	14.51	2.20	14.89	3.21	3.49	6.48	2.06	0.33	11.64	3.40	3.72	8.78	74.71
Nashville, Tenn	7.15	5.77	2.52	2.68	1.26	0.95	4.05	1.06	4.95	9.47	1.95	6.02	47.13
New Haven, Conn	11.05	1.20	5.34	1.07	4.43	2.38	2.60	1.07	8.09	3.44	2.14	6.17	48.98
New London, Conn	5.65	0.48	5.00	1.44	5.26	2.43	3.67	1.60	10.96	2.52	2.11	7.70	48.82
New Orleans, La	4.73	4.44	0.26	0.24	4.35	9.57	5.30	0.93	4.94	4.79	1.48	2.75	43.83
Newport, R. I	4.92	0.82	4.90	1.98	7.98	3.75	3.00	1.45	10.02	3.47	1.96	3.63	47.78
New York, N. Y	5.72	2.97	5.24	1.68	4.40	2.29	3.55	1.67	6.65	3.18	0.73	3.31	41.39
Norfolk, Va	5.50	4.54	9.09	1.52	3.28	1.94	3.85	1.47	4.85	9.98	2.84	4.79	53.65
North Platte, Nebr	1.16	2.46	1.47	1.07	0.49	0.51	1.38	0.37	0.19	0.37	3.22	2.99	15.68
Omaha, Nebr	7.30	6.27	4.93	0.69	1.17	0.16	0.53	0.44	1.26	6.24	8.62	8.36	45.97
Oswego, N. Y	3.30	0.45	4.13	3.41	2.55	1.02	2.31	0.22	4.48	1.66	0.54	3.33	27.40
Pembina, Dak	5.52	6.47	0.54	0.14	0.39	0.43	0.06	0.10	1.13	0.68	4.15	9.85	29.46
Philadelphia, Pa	5.71	0.98	8.77	1.06	7.31	1.40	2.62	0.84	3.40	2.66	1.10	5.22	41.07
Pike's Peak, Colo	2.20	4.63	1.60	1.45	1.06	0.79	1.49	1.29	1.53	2.91	2.82	3.36	25.13
Pittsburgh, Pa	5.86	2.72	7.35	1.14	2.03	0.83	2.99	1.43	5.31	2.88	1.66	3.54	37.74
Port Huron, Mich	3.04	3.00	2.88	2.72	1.66	3.24	2.33	0.00	6.25	2.20	1.34	4.59	33.25
Portland, Me	6.00	0.54	4.29	1.57	2.83	2.48	2.65	0.60	5.91	2.26	2.26	3.43	34.82
Portland, Oreg	0.96	0.56	1.09	10.53	10.03	0.88	2.75	7.56	11.31	2.44	2.24	2.05	52.40

* No observations from Sept. 17 to 27.
§ Station discontinued April 30, 1877.
† Observer absent from station.
‖ Twenty-three days' observations.
‡ Ten months.

Monthly and annual amounts of rain-fall, &c.—Continued.

Stations.	1876.						1877.						Annual amounts.
	July.	August.	September	October.	November	December.	January.	February.	March.	April.	May.	June.	
Punta Rassa, Fla	16.95	5.19	4.07	5.25	2.56	0.47	1.53	2.89	0.84	1.09	4.38	1.26	46.48
Rochester, N. Y	4.59	0.36	5.69	1.26	1.77	1.72	3.10	0.46	3.55	2.67	1.20	3.16	29.53
Salt Lake City, Utah	0.83	0.92	0.42	3.27	0.81	1.80	0.87	0.38	2.93	2.14	3.49	0.80	18.66
San Diego, Cal	0.03	0.06	0.03	0.08	0.04	0.15	1.05	0.23	1.44	0.26	0.43	0.00	3.80
Sandy Hook, N. J	4.33	1.66	6.74	2.22	6.53	3.22	3.90	1.56	9.09	5.72	2.81	3.57	51.35
San Francisco, Cal	0.01	0.01	0.38	3.36	0.25	0.00	4.32	1.18	1.08	0.26	0.18	0.01	11.04
Santa Fé, N. Mex	5.43	2.13	0.85	0.75	0.97	0.38	0.18	1.08	0.14	1.83	0.92	0.13	14.79
Savannah, Ga	6.11	6.88	2.63	9.45	0.88	4.81	2.63	1.71	4.25	8.82	2.04	8.52	58.73
Shreveport, La	1.87	2.22	0.62	5.42	2.99	2.38	2.84	2.48	3.87	5.42	1.24	2.55	33.90
Smithville, N. C	4.85	6.36	9.91	8.89	1.98	5.14	2.98	2.77	5.73	5.18	2.55	5.19	61.53
Springfield, Mass	5.67	1.61	4.78	1.47	3.69	3.30	2.52	0.70	8.40	2.88	0.92	3.42	39.36
Saint Louis, Mo	5.90	5.03	7.63	1.66	1.74	0.18	1.24	0.88	3.41	2.86	3.11	8.69	42.33
Saint Michael's, Alaska	1.81	3.13	3.24	1.67	0.33	0.10	0.93	(*)	0.27	0.42	0.39	1.09	†13.37
Saint Mark's, Fla	7.17	4.13	1.61	14.59	1.13	8.51	1.43	2.21	7.11	6.50	2.93	7.06	64.38
Saint Paul, Minn	2.73	5.28	2.99	1.27	0.93	0.25	0.55	0.01	1.57	1.92	5.43	7.13	30.06
Thatcher's Island, Mass	6.60	0.37	4.12	1.75	9.46	2.32	2.26	0.95	8.61	4.42	1.73	2.45	45.04
Toledo, Ohio	4.36	2.95	4.36	2.61	2.07	2.97	1.88	0.08	5.89	2.55	0.65	5.11	35.48
Tybee Island, Ga	11.26	4.47	7.07	8.86	0.04	5.73	4.32	1.90	4.48	9.17	3.29	7.82	68.41
Vicksburg, Miss	3.34	2.86	1.95	2.21	2.62	5.74	3.61	3.26	4.83	8.44	0.69	3.76	43.31
Virginia City, Mont	1.96	1.56	0.88	0.91	0.20	0.91	0.56	0.73	1.35	1.38	3.93	2.08	16.45
Washington, D. C	5.12	4.17	10.81	2.99	2.83	1.30	3.73	1.16	3.58	4.87	2.26	5.92	48.74
Wilmington, N. C	7.62	8.55	9.41	7.22	1.65	5.48	2.37	1.65	4.52	6.61	2.36	7.48	64.92
Wood's Holl, Mass	3.13	0.99	5.88	0.94	11.70	4.49	2.83	2.84	10.78	4.20	2.39	2.22	52.39
Yankton, Dak	5.49	5.14	5.26	0.88	0.80	0.37	0.74	0.33	1.37	5.99	4.45	5.07	35.89

* Amount unknown. † Eleven months only.

PAPER 19.

Maximum, minimum, and mean temperatures.

STATION, ALBANY, N. Y.

Day of month.	1876. July.		August.		September.		October.		November.		December.		1877. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	81	60	83	59	90	65	56	45	63	51	16	5	24	12.5	48	36	41	28	49	36	56	42	85	58
2	91	71	83	59	72	55	57	45	70	53	21	5	17	7	43	35	44	27	47	29	48	38	87	65
3	86	70	82	56	73	48	62	43	65	45	32	16	16	3	41	30	43	35	40	27	53	32	85	66
4	92	68	82	63	73	53	58	50	52	41	31	24	12	− 1	38	25	41	25	50	27	52	39	75	62
5	84	62	88	66	65	46	51	46	47	35	32	22	15	− 3	37	18	32	20	48	35	60	33	65	53
6	79	65	93	70	71	44	62	46	50	27	38	23	26	− 5	36	25	26	17	44	35	63	36	61	55
7	81	54.5	90	71	73	51	53	41	52	41	40	25.5	38	17	39	28	33	19	46	30	60	36	68	58
8	90	68	85	66	71	60	50	37	46	40	37	25.5	40	16.5	36	19	45	20	47	27	61	41	76	60
9	93	75	85	60	68	52	48	37	47	34	32	8	17	1	33	15	54	24	55	35	52	41	76	65
10	93	71	88	61	67	49	59	41	42	31	10	1	17	− 3	35	15	27	17	54	34	51	40	75	53
11	89	72	90	65	65	54	45	32	44	36	15	2	28.5	8	41	21	36	17	55	35	59	41	69	47
12	87	70	89	67	72	51	51	28	49	39	26	2	26	− 7	41	16	36	30	43	33	67	45	75	52
13	90	67	90	69	69	47	59	38	53	37	41	24.5	14	− 7	21	7	33	17	52	26	71	43	78	59
14	88	69	90	68	70	51	58	39	45	38	40	28.5	24	8.5	24	4	34	15	56	29	75	46	83	66
15	84	66	92	71	71	59	41	31	39	30	32	16	15	1	35	5	34	20	58	31	80	52	85	63
16	85	59	80	62	64	48	50	33	40	29.5	26	− 2	24	10	41	33	31	17	62	34	78	55	80	67
17	89	64	78	60	57	50	50	36	46	29.5	8	− 7	23.5	7	35	15	23	7	65	46	83	63	77	60
18	90	73	82	55	73	57	51	32	47	35	13	4	24	− 3	26	15	19	3	52	42	84	63	78	56
19	90	69	78	64	64	56	57	32	46	37	26	3	31	20	24	11	25	6	45	38	80	62	83	63
20	93	69	79	52	64	55	61	36	46	36	11	− 1	41	21	30	10	31	10	50	42	75	65	71	53
21	81	63	68	46	65	57	67	49	47	38	12	− 3	27	13	42	22	41	25	45	39	73	56	73	59
22	79	51	77	47	65	55	70	59	47	39	26	9.5	26	7	47	28	42	33	63	39	64	53	66	50
23	72	57	81	56	68	50	70	59	43	34	25	16	27	7	45	24	52	32	73	40	60	43	73	47
24	74	53	82	58	62	55	63	48	40	32	20	− 3	25	2	42	33	44	31	75	45	51	39	78	54
25	70	53	86	66	70	53	52	45	39	28	11	− 8	15	2	35	30	48	29	62	43	55	42	84	69
26	72	53	76	56	60	47	49	40	34	29	23	8	29	2	36	31	42	37	62	39	61	46	67	60
27	76	48	73	54	55	45	46	32	38	28	29	8	38	26	35	24	49	37	67	38	65	47	72	59
28	82	65	76	48	62	47	43	29	41	27	21	2	28	10	38	20	37	24	61	45	76	49	76	62
29	77	61	79	52	70	53	41	25	36	21.5	27	7	35	26	.....	.....	29	22	66	46	80	49	79	61
30	74	56	85	52	69	48	50	23	32	9	28	17	34	17	.....	.....	42	28	60	47	80	53	81	57
31	75	57	85	54	.....	.....	61	34	.....	.....	24	19.5	37	15	.....	.....	46	30	.....	.....	83	53	.....	.....
Range	45°		47°		46°		47°		61°		40°		48°		43°		51°		49°		52°		40°	
Monthly means	73°.9		72°.9		59°.2		46°.6		40°.3		18°.3		17°.1		29°.2		30°.5		46°.6		57°.9		68°.2	

Maximum, minimum, and mean temperature—Continued.

STATION, ALPENA, MICH.

Day of month.	1876. July.		August.		September.		October.		November.		December.		1877. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	65	49	76	60	67	52	50	38	53	44	19	8	20	15	39	35	37	17	59	28	45	31	76	56
2	61	55	75	58	67	47	65	39	45	37	26	17	21	14	37	33	34	20	28	17	48	27	81	64
3	80	61	73	59	64	44	55	38	43	36	26	21	14	3	38	25	31	14	30	10	52	32	73	52
4	72	61	77	65	62	48	47	33	44	35	29	15	16	— 3	36	18	23	10	34	30	51	31	68	51
5	71	59	81	67	64	40	47	29	48	39	35	10	22	13	36	28	19	1	37	31	56	28	62	44
6	68	52	85	68	61	41	50	37	46	37	37	27	28	19	47	31	23	— 6	37	24	53	32	70	45
7	94	65	83	63	61	57	42	33	37	33	27	15	30	8	36	23	21	2	35	24	54	36	64	45
8	97	66	74	53	67	53	36	29	33	30	19	6	10	— 6	31	15	19	12	42	25	55	37	65	53
9	94	70	76	58	61	50	56	28	40	30	6	— 6	8	—14	35	11	18	5	46	36	55	41	64	52
10	74	60	75	62	60	58	42	30	40	23	9	— 8	21	7	39	27	23	4	56	34	54	39	53	43
11	72	53	76	69	65	52	40	28	43	33	19	— 2	19	— 2	53	27	34	10	53	38	54	41	51	37
12	85	64	74	68	58	42	50	28	45	38	32	18	4	— 5	40	9	23	13	45	32	52	31	65	49
13	81	65	76	66	60	38	44	36	47	31	38	30	22	— 5	23	4	33	2	45	27	53	34	67	50
14	82	60	80	63	63	38	40	25	33	29	37	11	19	0	29	8	31	10	48	26	59	38	64	45
15	77	56	72	59	63	42	35	20	34	25	19	6	19	11	40	24	26	3	43	27	56	39	67	59
16	74	57	70	56	61	39	52	33	38	32	9	— 9	14	3	34	17	14	— 1	44	35	72	49	70	56
17	91	67	67	61	62	41	42	31	38	30	14	— 9	26	5	27	13	16	— 8	46	30	80	47	65	48
18	85	69	74	62	70	50	50	27	41	38	16	9	26	11	28	15	20	6	48	39	83	56	84	58
19	80	60	80	69	65	45	51	39	43	40	15	4	28	5	26	16	20	1	51	38	63	53	66	50
20	80	59	64	49	68	54	51	48	43	40	17	1	29	4	45	11	34	8	61	33	64	47	64	43
21	69	53	70	42	64	58	58	48	43	40	20	14	21	2	57	34	41	25	57	34	75	51	65	49
22	63	53	70	50	62	56	54	46	41	30	21	13	19	8	51	34	28	22	61	33	64	45	65	46
23	72	49	67	62	66	58	49	41	30	26	17	6	20	1	34	23	25	12	53	47	56	38	47	45
24	69	53	75	66	63	54	45	35	31	25	19	2	14	2	35	23	25	5	58	34	58	33	73	58
25	67	46	73	57	68	51	42	33	34	28	23	14	21	1	32	24	29	23	42	29	65	41	80	57
26	65	45	67	49	51	42	38	32	33	29	25	17	46	18	34	19	39	21	48	29	68	46	65	55
27	69	63	77	43	55	42	37	31	33	29	23	12	32	27	31	15	40	25	43	34	70	45	69	52
28	77	61	71	48	58	42	42	33	33	26	28	7	49	25	42	17	34	23	41	33	66	42	69	56
29	73	56	72	56	50	38	44	39	27	18	21	13	43	20	.....	.....	43	20	37	32	64	45	75	58
30	79	55	70	58	50	36	49	40	18	10	16	4	32	20	.....	.....	35	20	44	32	80	56	88	59
31	84	57	87	61	.....	.....	55	46	.....	.....	24	12	45	32	.....	.....	35	31	.....	.....	67	53	.....	.....
Range	52°		45°		34°		45°		43°		47°		63°		53°		51°		51°		56°		51°	
Monthly means	67°.3		67°.1		55°.1		40°.5		34°.8		15°.5		15°.8		28°.2		20°.1		38°.6		51°.0		60°.5	

Maximum, minimum, and mean temperatures—Continued.

STATION, ATLANTIC CITY, N. J.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	85	67	70	65	84	68	63	47	61	49	26	10	32	13	49	36	50	27	47	39	58	42	81	60
2	82	71	71	67	79	60	65	43	64	54	27	16	28	13	49	37	51	37	53	40	53	42	77	60
3	92	67	75	68	75	54	65	45	60	45	35	20	19	8	46	35	53	39	44	30	59	35	79	63
4	78	66	76	68	83	58	71	54	56	38	33	17	17	4	43	31	58	31	41	37	66	45	84	62
5	76	64	83	68	73	58	71	50	52	39	33	17	27	5	39	30	36	27	43	36	52	46	69	60
6	89	64	61	71	74	46	74	59	56	36	40	19	38	22	45	30	40	23	58	37	52	44	69	61
7	79	65	82	71	68	61	62	44	56	46	45	30	45	31	51	31	49	34	60	35	67	45	71	59
8	93	66	86	72	82	60	59	39	51	43	43	29	40	28	42	27	48	38	43	32	53	47	74	60
9	98	71	80	71	73	61	57	42	55	42	41	5	29	12	38	23	52	27	43	40	50	45	71	63
10	82	71	79	73	67	64	66	52	43	38	24	3	35	15	39	25	34	20	44	36	54	44	69	62
11	87	70	79	68	65	60	57	39	50	36	30	18	35	17	48	27	41	21	55	32	55	43	62	54
12	84	69	85	73	67	58	55	36	53	32	34	23	38	30	46	33	45	35	63	36	61	46	65	55
13	85	71	81	75	69	58	60	38	62	37	43	30	36	27	34	18	47	38	43	39	62	47	73	59
14	89	68	84	71	74	66	64	47	67	49	45	37	35	27	41	12	42	36	44	39	69	47	73	61
15	83	70	87	70	78	63	56	30	52	42	44	24	37	29	40	20	41	27	52	33	74	52	73	61
16	82	69	85	72	68	59	51	30	45	38	42	9	52	33	46	33	42	24	52	39	67	52	69	62
17	84	69	78	70	73	63	61	40	51	37	31	6	35	26	42	26	43	21	58	43	80	59	83	64
18	82	70	79	71	74	65	56	33	53	50	42	15	37	26	42	22	30	16	50	45	79	56	75	60
19	81	66	77	73	76	60	59	36	55	50	29	10	45	32	38	21	33	10	52	44	89	61	89	65
20	80	66	85	65	74	57	59	49	56	45	23	8	49	33	36	16	34	20	66	47	73	59	74	62
21	88	66	75	57	66	62	62	55	48	42	28	12	40	27	53	27	46	34	55	41	67	57	75	63
22	75	66	80	55	65	60	60	55	50	44	39	12	30	26	59	30	47	38	56	40	73	58	73	59
23	79	65	78	65	67	65	61	54	49	37	36	20	33	21	42	34	54	39	67	39	73	57	72	53
24	78	58	81	71	67	62	65	52	42	30	25	18	32	18	41	34	51	37	69	45	58	47	71	58
25	80	57	81	73	63	59	56	40	42	29	35	18	27	13	44	33	44	39	72	50	64	44	78	62
26	79	63	83	61	69	53	51	39	42	33	37	30	35	17	38	33	48	41	65	43	65	47	86	65
27	78	59	77	59	64	46	50	36	41	31	36	22	51	37	40	29	51	37	53	47	64	47	72	61
28	79	66	81	56	67	47	56	38	42	33	33	21	34	28	45	28	38	29	52	48	64	51	67	60
29	79	68	80	58	70	57	48	41	43	26	47	27	41	30	.....	.....	36	29	53	48	65	55	73	59
30	77	69	79	71	64	52	51	36	34	24	35	22	37	28	.....	.....	52	32	52	42	68	51	74	61
31	72	66	80	68	.....	.....	57	48	.....	.....	28	18	40	26	.....	.....	46	30	.....	.....	85	52	.....	.....
Range	41°		32°		38°		44°		43°		44°		48°		47°		48°		42°		54°		36°	
Monthly means	73°.0		73°.4		65°.0		51°.4		44°.9		27°.3		29°.4		35°.2		37°.2		46°.2		56°.7		65°.9	

Maximum, minimum, and mean temperatures—Continued.

STATION, AUGUSTA, GA.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	91	75	82	70	91	75	64	45	78	53	38	27	36	30	70	44	62	42	70	51	68	50	86	58
2	91	78	87	71	91	74	63	41	79	54	39	20	38	24	73	48	62	57	74	57	71	42	90	62
3	91	73	89	73	85	70	73	39	75	57	42	21	39	20	66	52	68	44	73	53	79	47	93	66
4	92	71	87	70	86	71	77	43	66	45	43	23	39	22	58	53	76	55	56	50	79	56	93	67
5	92	72	89	72	89	69	80	51	67	48	42	26	44	24	54	47	64	44	74	49	74	61	89	68
6	92	75	91	70	87	69	83	60	63	47	51	20	44	38	52	39	54	35	80	48	76	59	89	67
7	93	73	91	73	91	71	76	63	66	49	58	32	52	39	58	42	65	35	78	59	68	59	91	64
8	93	74	90	72	95	72	63	51	59	43	48	38	40	36	64	39	76	49	73	58	69	56	90	71
9	97	75	90	73	95	73	62	49	57	39	41	28	42	27	60	43	63	36	61	49	72	51	90	73
10	98	75	90	74	92	71	65	54	55	41	43	21	47	25	55	40	50	28	52	45	72	51	80	68
11	97	78	90	72	89	71	75	55	59	32	52	32	62	29	65	35	58	31	65	45	76	49	80	66
12	94	76	91	70	86	71	61	47	70	35	60	34	71	44	66	39	72	39	66	42	79	55	74	69
13	95	76	90	74	87	72	72	50	72	39	64	31	71	47	52	43	72	58	57	45	77	61	73	67
14	95	75	87	71	87	71	77	49	73	44	65	38	72	59	43	35	71	58	63	43	80	62	75	70
15	97	76	92	72	85	70	71	48	71	56	56	37	72	60	41	32	62	45	68	42	80	64	85	70
16	97	77	93	73	75	66	60	39	59	45	58	32	68	61	50	39	70	40	76	48	82	60	84	71
17	93	76	94	74	83	64	67	36	54	49	56	34	78	58	55	37	66	45	80	54	83	57	87	72
18	93.5	76	97	76	84	60	74	40	60	50	50	35	61	50	61	33	59	37	79	57	83	58	89	74
19	94	75	96.5	78	86	60	70	51	60	39	44	23	63	50	68	41	72	40	77	62	87	65	91	71
20	93	76	97	77	86	61	71	64	62	35	50	21	72	57	56	47	75	50	79	59	88	68	93	71
21	96	73	89	79	81	72	80	60	65	37	59	32	63	59	65	32	68	54	79	59	91	71	93	75
22	89	72	88	70	86	70	86	59	67	40	64	45	60	46	61	35	64	41	79	50	94	73	92	74
23	94	74	88	72	85	67	71	58	62	33	52	45	46	42	59	45	71	39	82	50	91	67	83	69
24	94	74	92	73	86	65	71	49	50	35	48	33	51	38	57	42	76	45	85	51	83	66	87	69
25	74	62	90	71	85	65	68	48	53	42	33	29	48	29	59	38	63	53	85	64	70	57	95	71
26	85	62	91	71	87	61	69	39	56	35	40	33	55	34	59	38	54	42	78	63	76	49	97	76
27	87	65	90	72	76	60	66	43	65	39	44	35	62	42	61	42	69	44	80	60	78	50	93	75
28	89	71	88	75	76	48	70	40	58	44	40	36	60	35	64	36	71	44	75	65	77	58	90	71
29	90	74	87	72	80	52	79	45	47	42	45	28	66	33	.....	.....	69	41	79	63	80	55	90	72
30	88	72	90	70	79	56	80	52	48	33	39	25	68	38	.....	.....	70	46	76	57	81	55	90	68
31	87	69	95	74	.....	.....	77	53	.....	.....	42	22	66	39	.....	.....	73	44	.....	.....	84	57	.....	.....
Range	36°		27°		47°		50°		47°		45°		58°		41°		48°		43°		52°		39°	
Monthly means	82°.7		81°.6		75°.2		60°.1		52°.4		39°.1		48°.4		49°.5		56°.0		64°.1		70°.2		78°.8	

Maximum, minimum, and mean temperatures—Continued.

STATION, BALTIMORE, MD

Day of month.	1876. July.		August.		September.		October.		November.		December.		1877. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	89	71	76	65	87	70	60	45	68	48	28	18	23	10	60	36	53	31	59	42	53	44	86	61
2	94	71	73	63	78	66	63	43	76	49	34	20	28	13	58	43	53	37	60	44	55	42	89	65
3	93	75	74	65	77	57	65	42	68	46	57	26	23	8	52	37	54	42	51	32	59	41	90	69
4	95	73	82	67	83	57	62	49	56	41	38	23	21	6	48	36	57	33	46	40	67	44	85	71
5	92	72	85	70	74	59	58	47	55	41	35	22	25	1	42	32	40	28	48	38	64	46	80	66
6	90	71	89	70	72	51	77	50	54	37	42	21	38	10	47	32	41	26	60	38	61	46	81	67
7	89	73	90	73	74	59	64	45	54	42	48	31	45	31	55	29	53	31	62	40	65	44	77	66
8	97	75	87	73	88	65	61	38	55	39	43	31	40	22	46	31	65	38	51	38	54	47	83	63
9	99	79	87	68	77	65	57	40	54	39	38	4	25	11	44	28	57	25	50	39	57	47	85	70
10	97	80	85	74	71	59	68	42	53	39	23	1	30	13	43	25	33	17	60	39	60	45	78	63
11	96	76	87	72	65	59	58	40	51	35	29	18	40	17	57	29	41	21	66	42	61	45	73	60
12	96	75	84	72	67	57	52	33	54	34	43	23	40	29	63	30	53	31	64	43	65	45	73	59
13	95	76	79	70	72	56	61	35	68	37	56	28	42	29	36	21	50	41	49	37	66	47	81	64
14	91	73	86	70	77	62	69	42	65	49	52	34	39	27	41	18	45	36	58	37	72	50	87	68
15	91	77	89	70	76	61	50	33	52	43	47	26	36	27	44	24	45	24	64	35	77	55	86	69
16	90	71	87	74	67	59	53	30	48	41	41	13	54	32	52	32	45	27	63	41	86	61	79	72
17	90	73	90	75	71	56	63	36	47	38	21	8	43	27	48	27	49	20	71	50	88	66	89	70
18	93	73	80	71	74	58	60	36	54	44	32	15	38	28	44	24	31	9	61	53	92	67	85	68
19	92	76	78	72	74	60	61	35	52	46	30	10	43	33	41	30	30	15	60	48	92	75	93	70
20	97	78	85	69	75	58	63	49	52	45	25	12	54	33	40	21	35	12	67	52	87	71	83	70
21	88	76	76	55	72	62	70	57	54	44	27	14	43	29	56	28	48	27	51	43	87	69	88	67
22	88	68	82	56	67	58	65	59	59	45	36	15	33	25	57	30	51	35	72	45	88	66	77	65
23	82	67	80	63	69	59	65	55	50	37	34	23	38	22	52	36	64	39	77	51	75	58	75	55
24	77	59	84	68	67	61	64	51	44	33	29	20	33	19	43	33	64	38	80	54	60	50	82	60
25	82	59	84	70	73	59	56	42	44	31	27	18	32	13	46	35	56	40	71	60	66	46	92	66
26	81	63	81	71	71	55	53	40	42	33	37	23	41	16	41	34	52	37	65	50	71	51	95	71
27	83	59	78	61	63	46	53	41	37	29	34	22	52	25	44	34	52	40	56	51	73	55	84	68
28	88	62	81	62	66	45	58	35	45	31	30	18	41	32	50	32	47	32	59	50	75	51	71	64
29	84	67	82	58	71	49	50	43	44	30	37	22	47	27	.....	.....	47	30	65	52	80	56	80	61
30	78	65	85	68	60	49	53	45	39	25	33	22	51	29	.....	.....	56	34	64	51	80	56	85	65
31	70	63	87	70	.....	.....	57	47	.....	.....	30	17	45	29	.....	.....	50	37	.....	.....	83	62	.....	.....
Range	40°		35°		43°		47°		51°		56°		53°		45°		56°		48°		51°		40°	
Monthly means	80°.4		75°.9		65°.6		52°.4		47°.1		28°.7		32°.1		40°.5		41°.4		53°.6		62°.7		73°.7	

Maximum, minimum, and mean temperatures—Continued.

STATION, BARNEGAT, N. J.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	80	69	71	64	83	69	60	47	62	48	25	16	29	15	52	36	49	31	40	39	55	46	81	61
2	89	68	71	67	77	63	62	47	64	50	25	17	30	15	44	36	49	35	50	40	51	43	83	62
3	93	64	70	67	77	58	64	44	60	46	35	21	22	7	43	35	52	39	43	32	57	40	82	64
4	79	62	78	69	83	55	68	54	56	42	34	22	17	4	41	29	55	35	40	38	63	46	84	65
5	85	62	81	68	70	58	63	51	50	41	36	21	25	7	39	29	37	29	42	37	54	47	68	59
6	89	63	84	68	74	52	72	58	55	42	39	23	39	14	41	30	36	25	54	35	51	44	69	57
7	78	63	86	70	66	59	60	45	55	50	45	27	44	33	50	30	55	33	57	35	59	43	72	58
8	90	65	84	68	77	63	60	40	53	47	40	27	39	28	39	28	49	39	43	32	54	47	76	60
9	95	72	81	68	73	62	51	42	52	45	39	8	29	14	34	25	52	29	42	39	48	45	72	62
10	84	70	80	70	67	62	65	40	48	39	18	4	35	24	40	30	32	23	44	37	51	44	73	60
11	83	70	80	61	64	57	56	40	48	39	34	17	33	13	42	27	40	21	52	35	53	44	62	54
12	92	66	83	71	68	58	51	36	51	37	34	26	34	29	49	32	44	35	52	39	57	44	64	52
13	87	75	82	74	71	60	57	33	62	39	44	27	34	24	33	20	44	37	45	38	62	43	69	60
14	88	71	81	74	73	65	63	42	65	48	47	33	32	22	37	16	40	35	43	39	72	49	73	60
15	84	73	93	69	75	62	53	28	51	44	43	23	36	29	38	23	38	26	49	34	75	53	74	57
16	82	68	81	72	66	60	50	29	45	39	42	11	48	34	44	28	39	26	54	38	67	54	70	60
17	85	64	80	73	73	60	58	39	51	39	29	7	34	26	41	28	42	23	53	43	79	59	78	59
18	86	68	76	71	74	64	52	36	53	48	43	17	36	25	38	24	29	17	46	44	86	60	74	61
19	81	64	76	71	75	60	58	38	54	50	28	10	44	32	36	22	29	14	52	43	84	62	85	62
20	78	63	84	66	69	59	60	48	54	46	23	13	48	34	34	18	32	20	59	46	77	58	74	60
21	84	69	73	58	65	60	59	56	49	43	30	18	40	27	49	26	49	32	54	40	64	56	74	60
22	76	63	79	57	63	59	58	55	49	44	39	14	30	25	58	31	45	39	52	40	79	57	72	59
23	84	65	77	62	66	61	60	55	46	39	38	22	32	20	44	32	50	39	64	40	72	56	68	56
24	76	59	80	71	65	62	63	51	43	34	24	19	31	17	40	34	49	35	65	45	56	48	71	57
25	81	58	82	71	63	58	54	40	41	33	37	18	26	12	44	34	42	40	68	49	61	47	80	60
26	81	58	77	67	67	55	50	37	39	34	38	32	34	17	38	33	49	39	62	44	60	49	84	63
27	82	61	76	61	63	46	48	39	40	31	34	25	48	26	39	30	48	40	57	48	61	48	69	58
28	81	66	77	59	66	45	53	38	42	31	32	22	34	29	45	30	40	31	48	47	64	46	71	60
29	85	68	76	61	69	52	46	40	42	29	48	31	40	29	.....	.....	35	30	51	47	67	52	71	60
30	77	66	86	67	59	53	50	37	34	24	34	22	37	27	.....	.....	49	33	52	45	69	51	75	61
31	72	64	75	66	.....	.....	58	43	.....	.....	28	17	38	24	.....	.....	44	32	.....	.....	80	56	.....	.....
Range	37°		36°		38°		44°		41°		44°		44°		42°		41°		36°		46°		33°	
Monthly means	74°.3		73°.3		64°.5		50°.6		45°.5		27°		28°.6		34°.8		37°.1		45°.6		56°.3		65°.5	

Maximum, minimum, and mean temperatures—Continued.

STATION, BISMARCK, DAK.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	81.5	47	82	60	69	42	71	23	37	30	11	— 8	2	—15	45	25	32	17	15	5	66	34	50	37
2	78.5	59	93	55	76	45	55	39	33	29	18	3	21	—23	33	13	17	2	28.5	1.5	57	44	52	36
3	74	51	82	61	71	48	43	26	49	27	21	0	28	10	49	13	26	0	42	18.5	58	32	64	44
4	72	49	91	62	60	48	51	23	30	14	30	3	32	9	35	25	20	— 3	40	11	67	44	73	43
5	84	49	74	62	60	50	59	33	23	14	38	11	38	25	43	20	32	— 2	39	31	54	39	75	47
6	81.5	54	88	45	70	53	54	30	39	9	27	17	28	— 4	37	21	29	4	35	22	54	33	67	53
7	80	64	100	62	66	44	49	27	45	5	29	10	4	—20	46	19	8	— 2	50	25	61	33	65	42
8	90	62	105	69	60	49	56	21	51	30	23	—18	5	24	39	7	11	— 3	37	19	55	43	57	34
9	76	54	93	51	57	46	61	32	63	25	22	—10	9	— 7	49	16	16	— 6	43	25	73	49	73	35
10	98	63	74	48	68	43	47	22	67	29	40	22	12	—11	34	15	30	— 5	54	28	64	49	58	49
11	78	57	86	52	63	50	63	21	47	17	41	32	7	—22	22	0	24	7	57	36	70	53	64	45
12	73	57	80	52	62	50	49	25	18	11	43	34	4	—26	22	— 5	30	13	54	41.5	71	45	66	48
13	78	45	65	56	65	45	50	27	22	— 1	42	7	26	0	44	12	28	8	61	41	60	48	63	44
14	80	62	72	46	71	39	51	14	27	— 1	29	— 9	5	—12	38	24	26	— 2	60.5	43	70	53	55	48
15	86	58	63	56	74	43	69	23	19	10	37	—12	—10	—28	31	18	21	10	53	40	69	54	71	43
16	87	56	74	54	68	54	72	27	37	10	— 1	—10	0	—30	36	10	22	0	55	38	78	44	76	52
17	81	55	82	61	74	48	74	29	36	11	0	—20	5	—12	54	18	29	5	49	38	75	53	87	60
18	91	59	82	52	76	43	74	30	11	— 4	21	— 3	— 1	—14	46	30	20	10	56	38	60	53	66	52
19	81	66	73	54	68	48	58	48	31	2	8	0	11	— 7	50	22	39	— 2	64	33	66	48	75	46
20	80	54	86	46	71	37	49	44	33	9	27	6	22	—12	60	30	44	24	64	37.5	62	45	74	57
21	83	55	91	68	78	49	45	31	26	3	27	5	16	— 2	42	33	28	18.5	64	47	57	46	77	48
22	74	55	76	67	68	44	59	25	26	3	9	— 5	7	—17	37	17	19	6	49	36	54	43	85	56
23	79	56	75	56	72	38	43	32	38	3	— 5	—16	19	2	34	12	19	2	44	31	62	50	74	56
24	81	52	65	50	65	50	48	25	54	10	3	—10	22	— 6	35	16	35	7	57	30	72	52	71	52
25	81	54	68	42	62	42	56	22	35	13	— 1	—17	32	6	31	14	49	21	60.5	30	64	51	68	43
26	81	62	78	46	69	32	55	24	45	21	— 1	—20	36	15	33	18	39	27	52	28	65	52	69	46
27	88	51	81	53	75	40	63	24	29	15	16	— 9	44	21	37	15	44	30	54	27	77	52	63	54
28	87	58	81	59	54	37	68	32	20	6	6	—13	37	9	38	25	39	31	52	30	83	59	74	44
29	94	59	80	62	46	29	66	37	11	— 9	— 4	—23	22	6	.....	.....	40	34	55	27	83	62	66	53
30	100	69	83	54	47	10	53	31	7	—15	12	—14	35	8	.....	.....	49	36	66	29	84	57	71	56
31	89	69	71	52	.....	.....	43	27	.....	.....	3	—11	39	21	.....	.....	39	20	.....	.....	66	45	.....	.....
Range	55°		63°		68°		60°		82°		66°		74°		65°		55°		64°.5		52°		53°	
Monthly means	70°.3		68°.0		53°.7		40°.7		18°.3		6°.8		6°.3		26°.5		19°.0		40°.4		56°.9		59°	

Maximum, minimum, and mean temperatures—Continued.

STATION, BOERNE, TEX.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	.....	.....	.....	.....	95	62	68	53	81	67	50	24	56	30	67	58	62	41	78	61	79	40	87	70
2	.....	.....	.....	.....	92	72	72	43	65	42	55	16	59	26	68	56	70	43	64	48	72	54	87	72
3	.....	.....	.....	.....	91	71	79	52	64	36	57	23	53	23	71	48	82	48	74	55	89	64	86	67
4	.....	.....	.....	.....	99	72	85	61	64	50	55	23	57	24	68	40	60	42	88	48	74	55	88	67
5	.....	.....	.....	.....	99	72	85	64	76	62	52	34	60	41	67	39	53	39	84	63	71	55	89	67
6	.....	.....	.....	.....	95	72	86	66	69	56	52	38	71	29	62	38	60	33	80	67	74	60	92	67
7	.....	.....	.....	.....	95	72	85	60	68	39	67	45	67	34	69	45	66	51	85	64	82	48	82	73
8	.....	.....	.....	.....	96	72	85	60	75	40	62	40	39	20	62	41	73	54	81	58	83	55	86	73
9	.....	.....	.....	.....	99	73	86	52	77	48	65	31	53	21	60	36	56	31	82	45	80	52	81	58
10	.....	.....	.....	.....	84	72	84	51	75	39	69	37	67	33	64	35	57	38	67	50	78	60	77	45
11	.....	.....	.....	.....	87	61	87	56	75	54	71	48	72	51	58	46	67	56	74	57	82	62	81	54
12	.....	.....	.....	.....	88	55	81	58	75	61	62	42	62	29	60	43	75	60	63	48	85	62	78	51
13	.....	.....	.....	.....	91	61	81	57	73	36	71	48	41	25	52	33	81	49	69	46	75	65	79	50
14	.....	.....	.....	.....	88	61	81	59	47	25	61	44	55	36	56	36	87	55	78	43	86	66	75	62
15	.....	.....	.....	.....	86	60	65	49	47	34	60	36	65	40	53	36	85	54	80	50	83	67	82	67
16	.....	.....	.....	.....	87	54	65	44	63	30	61	31	40	26	50	42	84	64	70	62	84	66	88	68
17	.....	.....	.....	.....	87	60	71	54	73	35	67	47	55	34	57	36	68	42	80	64	85	68	84	70
18	.....	.....	.....	.....	88	62	73	60	65	44	55	27	62	38	63	42	72	36	77	55	83	68	80	68
19	.....	.....	.....	.....	80	61	86	50	67	30	46	22	62	48	74	51	67	52	79	50	77	65	82	71
20	.....	.....	.....	.....	85	62	86	64	71	44	63	39	58	43	60	42	85	69	77	44	89	64	85	72
21	.....	.....	.....	.....	89	59	91	67	67	49	64	38	44	34	60	33	79	55	84	62	89	64	85	75
22	.....	.....	.....	.....	89	51	72	48	52	40	61	50	45	36	69	48	74	53	78	64	88	65	88	75
23	.....	.....	.....	.....	88	60	79	41	48	37	53	42	49	32	70	34	76	56	86	68	90	67	87	71
24	.....	.....	.....	.....	89	62	81	44	61	41	51	20	52	29	65	33	55	33	69	64	85	63	88	75
25	.....	.....	.....	.....	78	63	79	51	67	36	30	16	55	42	65	44	74	35	74	63	84	60	87	75
26	.....	.....	(*)	.....	82	61	80	58	68	37	46	23	65	36	55	37	82	52	85	66	89	64	90	76
27	.....	.....	96	69	87	61	81	61	74	42	52	25	66	51	52	46	78	57	77	60	85	64	91	75
28	.....	.....	90	73	75	64	81	65	70	38	49	26	66	49	45	42	73	60	67	48	87	63	90	73
29	.....	.....	96	73	80	63	81	64	59	40	38	20	64	52	.....	.....	80	62	67	42	88	63	91	74
30	.....	.....	97	70	69	52	81	59	49	34	42	18	67	46	.....	.....	77	63	71	39	85	69	91	72
31	.....	.....	98	68	.....	.....	82	60	.....	.....	37	26	65	55	.....	.....	80	64	.....	.....	86	69	.....	.....
Range	.....	.....	.....	.....	48°		46°		56°		55°		52°		41°		56°		49°		50°		47°	
Monthly means	.....	.....	.....	.....	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

*Station supplied with maximum and minimum thermometers, and commenced reporting their readings on August 27, 1876.

Maximum, minimum, and mean temperatures—Continued.

STATION, BOSTON, MASS.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	80	66	73	59	91	66	60	46	57	47	21	8	28	12.5	55	36.5	46	25.5	46	36.5	51	45	92	64
2	93	69.5	74	61	75	59	64	44.5	75	45	27	4.5	27	13	53	36.5	51	29.5	44	37	46	38	86	63.5
3	89	74	74	57	74	53	68	42.5	66	45	39	26	25	6	53	35	49	37	47	35	55	34	84	63
4	92	70.5	79	58	80	55	70	52	57	38	36	23	16	2	45	32	49	27	42	29	58	40	78	66
5	85	71	83	61	65	50	56	47	51	37	42	23	22	6	50	27	43	24	38	33	65	37	78.5	52.5
6	81	70	93	69	70	47	69	46.5	50	31	46	22	37	8.5	42	28.5	36	21	48	33	50	42	68	54
7	81	65.5	95.5	71.5	66	50.5	59	43	52	42	45	26	44	28.5	46	26.5	50	21.5	51	36	55	38	58	53
8	90	69	89	73	66	57	56	37	52	44	40	29	45.5	28.5	43	25	53	25.5	49	33	52	39	66	54
9	83	63	82	67	59	52	55	35	52	44	34	12	38	9	36	18.5	57	29	48	37.5	47	39.5	75	54.5
10	85	62	83	64	65	48	64	37	47	37	14	2	28	5	44	17	31	21.5	51	36.5	44	37	76	63
11	93	70	81	64	71	51.5	53	36	49	40	14	2	37.5	13.5	44	27	39	18	52	39.5	50	40	67	55.5
12	84	68	83	66	70	55	55	31	46	40	29	9.5	36	11	53.5	28	41	29.5	45	32.5	64	42	65	55
13	96	72	87	68	72	52	63	39	52	38	48	22	24	9.5	28	15.5	37	29	54	31.5	76	47	77	58.5
14	81	66	87	66	75	55	63	40.5	47	36	46.5	35.5	30	10	35	14	33	20.5	46	34.5	78	50.5	87	60
15	84	65	80	68	77	58	53	31	45	37	46	17.5	23	6.5	51	23.5	34	24	52	32.5	82	59	80	64.5
16	88	64	75	64	67	54	47	30	42	31	42	1	36	15.5	54	32.5	33.5	18.5	55	36	80	60.5	77	65.5
17	91	66.5	73	63	57	55	48	38	45	29	9	4	23.5	11.5	40	20	30	24	52	41	83	51	79	64
18	92	66	71	63.5	68	57	54	32	45	38	33	2.5	40	9	33	13	25	14	47	39.5	71	42.5	82	55.5
19	88	73	70	61.5	69	58	58	34	45	38	27.5	5	44.5	30.5	36	14	28	8.5	42	30.5	76	62.5	87	62
20	92	73	80	57	63	52	61	40	43	40	22	4	46	30.5	31.5	13	36	14.5	45	39.5	76	55	76	67
21	85	70	65	51.5	55	50	54	42	45	37	18	2	31	20.5	45	23	52	23	53	40	56	47.5	73	54
22	70	62	74	50	60	49	58	43	38	34.5	25	11	35	21	56	29.5	51	42	49	37	64.5	50	71	54
23	67	59	66	56	61	47	59	49	44	34	31	14	32	19	37	28	53	37	66	41	60	46.5	74	47
24	75	58	79	54	57	52.5	66	47	42.5	31	21	5	27	10	36	30.5	51	38	57	42	50	42	76	55
25	77	57	84	64	62	52	63	42	41.5	28	24	5	18	3	37	32	43	35	73	43	55	43	87	63
26	78	57	80	65	55	52	53	39	39	25	31	11	34	19	44	31.5	43	33	64	43.5	55	42.5	70	56
27	73	52.5	71	56.5	64	45	52	34	43	24	35	18	47	28.5	40	28	49	40	65	43	56	45.5	64	55.5
28	80	63	73	57	65	44.5	47	29	42	26	28	10	43	10.5	43	23	46	38.5	52	42	79	44	75	53
29	83	68	76	53	68	51	48	26	39	26	40	15.5	40	21	.....	.....	44	32	45	41.5	83	52	75	57
30	79	60	82	58	74	52	58	30	33	14	40	19	43	27.5	.....	.....	41	29.5	59	40	86	56	71	54
31	62	56	87	60	.....	.....	60	35	.....	.....	26	17	50	27	.....	.....	44	33.5	.....	.....	86	56	.....	.....
Range	43°.5		45°.5		46°.5		44°		61°		52°		48°		43°		48°.5		44°		59°		45°	
Monthly means	73°.1		69°.5		58°.9		48°.0		40°.8		22°.3		24°.2		33°.6		35°.1		44°.3		54°.9		66°.5	

Maximum, minimum, and mean temperatures—Continued.

STATION, BRECKENRIDGE, MINN.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	75	53	92	67	70	41	66	22	42	28	5	−26	−12	−25	25	9	36	14	33	3	63	39	57	45
2	81	47	83	67	70	35	63	33	39	30	13	− 9	0	−26	32	6	16	4	26	4	60	41	56	41
3	81	51	88	66	69	49	42	33	43	28	20	− 8	2	−23	37	14	22	− 5	45	23	61	40	62	43
4	78	49	90	64	63	43	44	19	32	19	21	−11	16	− 2	32	13	19	0	33	14	65	31	71	46
5	79	47	79	63	57	52	57	21	32	20	37	9	30	9	37	9	22	− 5	43	22	58	44	78	46
6	89	63	85	50	73	52	42	29	26	7	27	10	25	− 2	33	21	20	− 3	34	20	49	40	71	50
7	95	73	88	55	62	52	44	27	32	− 3	10	− 9	− 2	−20	32	2	3	− 7	49	28	60	40	73	52
8	91	70	101	67	59	39	47	17	39	24	− 2	−30	− 9	−32	30	0	9	−11	39	25	65	35	58	41
9	74	62	95	69	55	50	64	27	52	23	1	−33	1	−17	37	18	16	−10	48	26	69	46	56	30
10	84	47	80	54	61	49	41	19	60	30	13	− 3	− 1	−24	27	12	26	− 5	56	29	72	39	61	34
11	85	65	79	44	63	52	51	10	39	28	36	12	− 4	−28	12	− 5	22	3	59	35	70	43	62	41
12	81	56	88	62	67	50	51	25	28	14	42	22	− 7	−31	20	−18	35	6	62	30	72	37	61	31
13	81	58	68	56	62	51	45	25	14	− 2	36	8	22	−19	30	12	36	10	63	36	74	42	66	47
14	81	53	68	52	65	43	36	13	22	− 6	8	−15	4	−19	34	6	24	− 1	64	38	65	53	67	44
15	86	48	65	52	69	35	55	8	32	11	35	−18	− 4	−28	33	15	21	5	53	35	79	59	69	46
16	80	63	73	55	75	53	72	24	30	15	− 7	−26	− 8	−30	21	2	15	4	58	38	76	51	80	43
17	82	67	77	62	75	58	70	28	32	15	− 6	−14	− 4	−12	43	2	24 5	3	54	41	71	57	89	58
18	86	58	82	66	68	56	67	37	20	6	18	−18	− 3	−17	39	25	18	3	60	42	71	47	76	59
19	90	69	70	54	69	49	58	41	25	0	3	−17	− 3	−18	36	20	23	− 7	63	33	76	60	78	42
20	78	56	80	46	69	49	53	48	29	12	15	− 8	5	−18	53	18	29	9.5	63	32	64	52	69	57
21	78	50	70	63	72	35	49	41	15	3	17	−12	13	− 7	42	23	27	16	67	42	58	46	71	48
22	73	54	82	68	73	53	47	32	22	2	1	−19	− 3	−25	36	19	19	− 2	65	42	61	45	81	42
23	79	48	76	61	76	34	42	26	20	8	1	−21	18	− 5	30	6	11	− 9	44	34	69	41	82	63
24	80	52	67	49	65	47	43	34	28	17	2	−17	8	−14	26	6	17	−14	55	31	75	38	74	52
25	81	47	67	44	62	37	40	20	28	11	0	−12	18	− 7	31	14	39	− 2	61	30	73	42	79	45
26	73	65	71	37	62	30	43	19	32	11	− 1	−12	30	2	35	11	35	24	52	30	71	46	73	50
27	85	55	85	57	72	33	47	31	11	−12	5	−25	29	7	43	14	37	12	50	30	68	46	72	50
28	85	60	78	59	57	34	58	28	9	−20	5	−10	33	10	38	17	43	19	50	30	82	56	74	53
29	84	58	81	62	45	34	52	39	10	0	− 7	−22	32	4	.....	.....	40	32	48	24	83	65	69	50
30	91	64	86	62	49	24	62	39	− 9	−23	− 3	−32	35	7	.....	.....	39	33	56	21	80	60	67	57
31	90	65	75	55	.....	.....	55	27	.....	.....	− 3	−17	31	11	.....	.....	43	33	.....	.....	75	55	.....	.....
Range	48°		64°		52°		64°		83°		75°		67°		71°		57°		64°		52°		59°	
Monthly means	70°. 9		67°. 6		53°. 8		38°. 1		18°. 7		0°. 1		— 0°. 9		21°. 5		15°. 2		40°. 5		58°. 4		58°. 9	

Maximum, minimum, and mean temperatures—Continued.

STATION, BROCKVILLE, CANADA.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	77.6	52.1	81.6	56.2	85.1	66.2	55.6	37.1	50.6	46.1	9	0.7	12	7.2	44.6	32.6	35.2	21.9	51.4	37.2	47.6	39	81.4	54.6
2	71.6	62.2	85.6	54.1	66.6	55.1	55.6	41.1	56.6	44.6	28.2	5.9	14.4	3.6	40.6	29	42.4	27.6	46.6	30.1	43.6	29.1	83.6	54.1
3	78.1	65.9	85.6	65.3	69.6	49.1	61.6	47.4	57.6	33.1	26.8	20.3	8	−11.6	39.4	29	43	30.1	32.9	20.3	49.6	28.1	77.1	57.2
4	74.6	64.2	84.6	66.3	71.5	55.2	55.6	44.2	49.1	29.6	25.7	12.8	5.2	−10.9	36	27.1	38.4	20.3	49.5	21.9	54.6	35.9	72.6	54.2
5	81.6	57.2	89.7	65.1	63.6	45.1	48.6	40.1	46.7	28.1	30.7	11.9	18.8	−15.2	34.1	23.3	27.6	3.7	40.6	35.1	57.3	29.1	66.6	52.6
6	80.6	61.2	87.6	65.3	69.6	54.1	58.6	39.1	48.6	33.1	36.1	25	32.7	8	36	28.2	20.8	4.4	52.7	33.1	58.7	33.9	72.6	47.6
7	77.6	58.7	83.6	71.3	74.1	50.1	51.6	34.1	48.6	41.2	36.6	20.8	33.1	16.2	39.1	27.5	32.7	15.7	42.6	27.1	51.6	35.6	74.2	57.2
8	86.1	63.4	84.6	62.2	70.6	59.2	48.6	32	43.6	34.1	29.7	11.7	31.8	0.8	29.7	14.4	26.7	14.7	46.6	26	53.6	34.1	81.4	58.3
9	90.6	69.3	87	57.1	61.6	49.1	45.1	27.5	39.6	31.1	29.2	−6.7	5.1	−21.7	.....	.....	49.1	14.5	51.1	32.1	50.6	37.6	77.6	61.2
10	87.3	70.2	90.6	58.2	66.6	40.1	53.6	39.1	39.5	28.1	1.7	−12.4	20.9	2.3	35.7	11.6	22.1	7.7	57.1	32.1	49.6	40.1	74.6	53.1
11	83.6	68.3	93.1	61.2	69.6	39.1	44.5	30.1	41.1	31.6	11	−2.7	26.7	18.9	40.6	17.3	30.8	14.8	54.6	30.1	60.6	40.6	65.6	45.1
12	83.1	66.3	90.1	68.2	63.6	45.1	49.6	26	45.4	31.1	24.7	8.4	21.8	−21.9	42.1	11.7	33.7	24	47.6	31.1	66.6	44.1	77.6	48.3
13	89.6	64.3	90.6	66.3	66.4	40.1	50.6	37.1	44.6	32.6	42.6	23	16.9	−17.4	16.7	1.3	24.2	16.7	51.9	26.6	68.8	42.1	76.6	52.1
14	83.6	65.3	92.6	66.3	64.6	40.1	44.6	29	42.6	32.1	38.6	28.4	19.8	−15.7	22.8	−1.7	37.6	16.2	57.4	27.9	68.6	45.1	76.6	61.2
15	82.6	60.2	89.6	64.2	65.5	49.1	35.6	25	33.2	26	36.6	10.5	3.2	−15.7	35.6	5.4	33.8	14.7	61	27	72.1	49.1	83.6	56
16	85.6	59.2	75.6	51	61.9	40.1	45.4	29	38.6	22.1	29.7	−17.5	16.4	−8.2	39	29	23	9.3	66.1	32.6	72.6	55.2	78.6	64
17	85.1	60.2	76.5	55.2	60.1	43.6	44.1	33.1	45.7	29.1	−4.7	−18.9	20.9	−16.9	30.8	13.9	13.8	−3.9	60.1	44.1	74.9	53.2	76.6	55.9
18	92.6	69.3	81.6	61.2	63.5	52.1	47.6	28	38.6	30.1	−1.3	−9.7	25.1	8.5	23.8	9.5	12.3	−3.2	60.5	37.1	73.6	59.2	80.6	61.5
19	88.6	56.2	78.7	64.2	58.7	53.1	58.6	31.6	45	36.6	18.4	−4.7	31	21.9	19.8	4.4	23.1	3.2	52.1	38.1	80.1	60.7	81.6	55.9
20	88.1	65.3	72.5	55.2	62.6	52.1	65.6	36.1	42.6	31.6	2.2	−12.6	40.4	15.9	27.8	13.8	29.7	9.5	43.2	35.1	77.5	56.2	69.1	44.1
21	72.6	56.2	70.6	41.1	66.6	54.1	66.7	49.1	43.6	34.1	7.1	−4.7	18.3	8.7	38.2	26	30.2	24	52.5	33.1	64.6	52.1	70.6	54.1
22	70.1	47.1	79.6	51.1	67.1	56.2	63.6	53.1	48.6	31.1	14.8	−1.8	30	5.4	45.4	32.1	39.6	28.9	69.5	32.1	64.6	42.1	65.6	47.8
23	68.6	47.1	78.5	53.4	71.6	58.2	70.6	55.2	41.6	35.1	15.9	−2.6	21.9	15.1	40.6	28.4	44.6	28.1	70.5	38.1	69.1	40.1	72.5	42.9
24	74.6	49.1	79.8	52.2	69.6	56.2	58.6	46.1	37.6	26	10.9	−8.3	20.2	−3.7	37.6	32.3	38.4	26	73.6	41.1	56.6	39.1	75.6	53.6
25	67.6	43.1	78.7	58.2	71.6	56.2	57.5	37.6	38.1	24.4	9.4	−11.7	7.3	−8.7	35.6	29.5	36.1	27	56.6	41.1	64.0	42.1	82.1	62.2
26	71.1	49.1	73.6	50.9	63.6	49.1	44.6	36.1	32.7	25	18.3	7.7	28.2	3.3	33.6	26	46.6	31.1	61.6	35.1	64.8	43.1	71.6	53
27	75.6	52.1	69.7	48.1	56.6	41.1	43.6	26.9	33.7	18.9	24.3	10.8	33.7	15.7	33.7	19.8	40.6	32.1	59.6	35.5	70.9	45.1	74.2	48.6
28	75.6	64.2	75.7	44.6	60.6	41.9	39.5	22.8	36.6	22.9	25.7	2.4	27.2	−7.9	36.6	16.7	33.7	20.8	49.6	37.1	71.6	45.1	81.6	52
29	79.1	59.2	77.4	54.1	57.6	49.1	39.5	20.8	30.7	22.5	15.9	1.3	28.7	18.6	.....	.....	35.6	16.2	61.5	43.8	71.8	51	78.2	55
30	79.6	57.7	82.6	48.6	54.1	36.1	51.6	20.8	25.7	6.4	17.8	7.3	32.8	24	.....	.....	41.6	21.4	56.6	43.1	77.7	48.5	79.7	58.8
31	82.6	65.3	82.6	56.2	.....	.....	52.6	34.2	.....	.....	18.8	3.9	35.4	26	.....	.....	47.1	26	.....	.....	73.6	54.4	.....	.....
Range	49°.5		52°.0		49°.0		49°.8		51°.2		61°.5		62°.3		.....		53°.0		53°.3		52°.0		40°.7	
Monthly means	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, BROWNSVILLE, TEX.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	.....	73	.....	81	.....	71	.....	59	.....	72	.....	39	.....	31	.....	55	.....	47	.....	67	*61	49	94	72
2	.....	72	.....	75	.....	73	.....	52	.....	61	.....	36	.....	32	.....	58	.....	50	.....	64	79	51	98	69
3	.....	73	.....	76	.....	70	.....	54	.....	53	.....	37	.....	42	.....	57	.....	63	.....	60	85	68	96	67
4	.....	70	.....	79	.....	70	.....	59	.....	58	.....	40	.....	42	.....	52	.....	63	.....	44	94	74	90	70
5	.....	69	.....	76	.....	73	.....	60	.....	60	.....	41	.....	36	.....	49	.....	62	.....	66	88	68	98	71
6	.....	74	.....	81	.....	72	.....	60	.....	61	.....	44	.....	37	.....	47	.....	45	.....	67	99	70	98	69
7	.....	76	.....	80	.....	71	.....	66	.....	55	.....	50	.....	39	.....	51	.....	48	.....	68	81	58	100	78
8	.....	77	.....	80	.....	72	.....	65	.....	51	.....	48	.....	34	.....	56	.....	64	.....	60	81	58	94	75
9	.....	78	.....	76	.....	73	.....	60	.....	53	.....	43	.....	28	.....	48	.....	50	.....	58	85	64	85	76
10	.....	81	.....	75	.....	74	.....	59	.....	50	.....	47	.....	44	.....	50	.....	53	.....	66	82	77	83	64
11	.....	80	.....	79	.....	70	.....	66	.....	52	.....	54	.....	47	.....	57	.....	60	.....	67	85	66	83	63
12	.....	79	.....	79	.....	72	.....	67	.....	56	.....	56	.....	64	.....	64	.....	65	.....	62	92	72	81	67
13	.....	76	.....	80	.....	68	.....	66	.....	59	.....	55	.....	38	.....	45	.....	66	.....	54	87	67	79	68
14	.....	76	.....	73	.....	67	.....	65	.....	40	.....	57	.....	39	.....	41	.....	66	.....	54	95	65	80	64
15	.....	74	.....	72	.....	69	.....	69	.....	40	.....	50	.....	40	.....	42	.....	64	.....	59	95	69	95	63
16	.....	74	.....	72	.....	72	.....	72	.....	44	.....	49	.....	43	.....	55	.....	65	.....	62	95	67	95	73
17	.....	78	.....	73	.....	64	.....	64	.....	50	.....	52	.....	36	.....	41	.....	64	.....	68	91	72	95	77
18	.....	79	.....	75	.....	70	.....	70	.....	58	.....	45	.....	38	.....	45	.....	47	.....	67	84	72	97	77
19	.....	74	.....	77	.....	69	.....	65	.....	45	.....	39	.....	52	.....	57	.....	48	.....	66	93	71	98	78
20	.....	77	.....	82	.....	73	.....	68	.....	47	.....	41	.....	59	.....	57	.....	64	.....	68	86	65	98	79
21	.....	73	.....	74	.....	69	.....	69	.....	51	.....	42	.....	54	.....	47	.....	62	.....	63	92	66	94	78
22	.....	73	.....	74	.....	65	.....	63	.....	56	.....	46	.....	48	.....	50	.....	62	.....	69	92	67	93	80
23	.....	73	.....	74	.....	64	.....	55	.....	44	.....	57	.....	40	.....	51	.....	66	.....	69	93	66	95	81
24	.....	78	.....	73	.....	66	.....	58	.....	44	.....	46	.....	42	.....	55	.....	54	.....	72	94	65	94	82
25	.....	74	.....	71	.....	71	.....	59	.....	40	.....	35	.....	44	.....	55	.....	40	.....	70	96	64	95	80
26	.....	82	.....	71	.....	69	.....	62	.....	41	.....	30	.....	47	.....	55	.....	49	.....	73	99	64	94	79
27	.....	86	.....	72	.....	70	.....	62	.....	44	.....	41	.....	48	.....	58	.....	51	.....	72	95	68	94	87
28	.....	86	.....	71	.....	66	.....	60	.....	47	.....	45	.....	53	.....	51	.....	67	.....	65	95	66	93	78
29	.....	88	.....	72	.....	68	.....	67	.....	56	.....	30	.....	52	.....	.....	.....	66	.....	60	96	69	92	79
30	.....	87	.....	73	.....	62	.....	64	.....	46	.....	31	.....	52	.....	.....	.....	66	.....	56	96	72	92	80
31	.....	87	.....	72	.....	.....	.....	65	.....	.....	.....	50	.....	54	.....	.....	.....	67	.....	.....	94	72	.....	.....
Range	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		50°		37°	
Monthly means	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

* Station supplied with maximum thermometer May 1, 1877.

Maximum, minimum, and mean temperatures—Continued.

STATION, BUFFALO, N. Y.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	72.5	55	82.5	59	75	62	53.5	42	50.5	52	14	6	20	13	44.5	33.5	41	24.5	61	39	39	36	83	59
2	79	69	84	61.5	68.5	53	56	46	68	52	23	13	19	12	40	31	48	34	46	25	46	33	78	63
3	73.5	68	83	65.5	68	48	56.5	48	53	43	25	19	18	7	37.5	33.5	37	33	36	21	44	36	71	60
4	75	62.5	85.5	71	71	54.5	51	45	46	41.5	26	15.5	16	9.5	34	29	36	22.5	54	26.5	44	36	63	57
5	82	61	87	75	65	50.5	49	39	49	37.5	32	23	23	10	32	24.5	25	19	42.5	32	59	32	61	48.5
6	74	62	79	75	70	43	57.5	45.5	47	39	35.5	25.5	38	23	32.5	26	29	11	37	31	60	39	63	54
7	76.5	63.5	78	71	71	55	48	41.5	46	41	35	25	35	26.5	35	29	29	19	43	29	59	37	73	52
8	77	70.5	77	64	69.5	60	48	34	43	38	29	17	26.5	7.5	29	21	45	20	47	29	57	39	82	57.5
9	80	72	86	60	65	54.5	51	34	42	37	17	5	9.9	7	31	19	48	14.5	51	34	54	41.5	75	65
10	82	74	85	67.5	61	53	54.5	38	41.5	35	9	2	24.5	9.5	37.5	23	20	10	54	34	53	41.5	65	52
11	77.5	67.5	82	67.5	60	54	41	32.5	43	34	26	2	29	19.5	45.5	29	33	17	54	33	53.5	43	71	49
12	80.5	70.5	82.5	71	65	49	47.5	30	46	32.5	35	23	22	1	45	15	36	25	48	34	58	40	72	54
13	82	74.5	87	70	66.5	43	52	43	54	36	42	33	16	0	18	11.5	31.5	22	52	30	68	41.5	71	59
14	80	71	86.5	72.5	71	54.5	49	29	51	34	35.5	27	20.5	15	32.5	11	40.5	20	55	32	69	44	69	60.5
15	78	66	81	66.5	65	54	37	25	35.5	31	29	14.5	27	12	34.5	32	24.5	15	46	34	73	45.5	80	63
16	82	62	75	61	68.5	44	49.5	35	39	34	30	0	22	10.5	36	25	22.5	15	52	36.5	68	49	65	59.5
17	81	63.5	79.5	60	57	50	50	36	43	32	13	0	23	9	36	19	15.5	7	62	37.5	65	50	68	57.5
18	81	69	82.5	63	64.5	53	48	28	52	40	25	6	32	12	27	18	16.5	3	52	48	61	53	77	54
19	86.5	68	79	71	64	58	63	34	49	42	22	10	35	27.5	26	17.5	22	7	57	40	75	50	73	59
20	82.5	67	71	57.5	71	56	72.5	50	44	39	12	9	39	15.3	29	17	31.5	7	44	35.5	80	61	74	52
21	72.5	59	69	46	74	54	73	59	47.5	39	24.5	10	15	9	41	26.5	35	29	58	39.5	68.5	54	71	56
22	73	51	72	50	67	58	66	59	47	37	28	22	25.5	14.5	50.5	36	43	29	48	37	59	51	63	50
23	67	56	75	63.5	64	56.5	70	50	40	31	24	17.5	18.5	10	51	37.5	43	30	64	43	51	39	68	45
24	68.5	54.5	83	63.5	63.5	59	55	43	33	30	20	8	18	11	40.5	33.5	35	23	58	41	50	36.5	71	57
25	67	49	75	62.5	65	58	45	39	36	30	23	7	18	10	35	29.5	51	28	47	38	57	45	68	62.5
26	67	47.5	71	55.5	63	46	42.5	36	34	30.5	26	20.5	34	17	34	29	51	35	59	37	53	46.5	71	59
27	80.5	51	69	53	52.5	44	40	32	34	28.5	24	18	35	27.5	33	29	36	30	63	40	60	48.5	71	57
28	76.5	65.5	71	49	60	47.5	40	32.5	35	31	22	18	36	24	32	26	31	22	60	44	66	53	80	58
29	75	60	74	59.5	58.5	51	45	31.5	34.5	28	23	17.5	35	25.5	.....	.....	35	21	54	41	73	52	71	62
30	75.5	58	77	67	52	46.5	58	32	30	19	21	14	34	21.5	.....	.....	39	27	47	38	71	56.5	78	62.5
31	80	62.5	78	69	.....	.....	61	51.5	.....	.....	22	14	44	20.5	.....	.....	50	35	.....	.....	75	55.5	.....	.....
Range	41°		41°		32°		48°		56°		42°		44°		40°		48°		43°		48°		38°	
Monthly means	71°.3		72°.6		59°.0		46°.1		39°.6		19°.7		20°.4		29°.8		27°.7		43°.6		53°.9		65°.3	

Maximum, minimum, and mean temperatures—Continued.

STATION, BURLINGTON, VT.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	80	55	80	56	84	63	56	39	52	45	14	5	23	9	45	37	33	24	51	37	53	41	84	52
2	73	63	88	56	70	57	58	44	60	43	23	9	15	6	45	36	43	25	53	34	44	36	88	62
3	82	66	87	63	72	54	62	43	59	43	30	22	12	1	42	32	43	37	35	22	49	32	83	63
4	83	65	89	65	70	55	57	48	50	33	30	25	5	— 1	35	26	39	24	52	22	54	36	73	57
5	87	59	92	69	58	45	51	43	46	32	31	21	15	1	36	21	33	21	52	37	57	31	67	54
6	80	64	97	72	65	50	58	41	49	29	36	22	30	4	39	26	27	14	47	31	57	32	64	52
7	84	59	92	69	69	45	52	42	48	39	39	30	36	25	40	30	28	18	42	29	57	35	74	52
8	91	64	82	67	66	54	48	35	41	34	32	19	36	13	34	16	39	14	45	29	53	33	80	52
9	86	70	86	57	57	48	48	34	48	35	32	— 3	13	— 6	32	12	55	20	55	32	48	34	82	67
10	89	73	91	62	63	41	56	41	42	33	3	— 6	23	3	36	14	26	15	51	30	48	35	80	55
11	80	68	95	65	69	42	45	35	45	35	12	— 6	29	18	42	18	35	18	52	30	57	37	70	47
12	91	66	90	70	61	44	52	31	44	37	30	12	27	—16	44	18	35	25	45	28	67	35	81	49
13	90	71	92	70	64	39	56	37	42	36	42	26	12	—13	18	8	27	17	53	26	72	40	83	60
14	89	68	94	70	65	43	50	33	42	33	44	34	20	— 1	26	6	39	19	55	32	74	46	79	63
15	78	64	90	67	69	54	35	26	35	28	38	21	13	— 7	40	16	36	20	60	30	72	56	87	54
16	87	59	73	55	58	43	45	30	36	25	21	—11	14	1	42	30	31	17	63	33	78	52	78	65
17	93	64	78	54	62	45	43	35	46	30	— 1	—13	18	8	39	16	27	4	59	43	81	61	76	60
18	93	74	80	53	72	50	50	34	45	26	20	— 2	25	8	25	13	14	2	57	36	78	65	82	53
19	94	65	80	66	60	53	58	31	46	36	19	3	40	20	22	8	26	10	49	33	78	61	83	58
20	94	69	73	55	61	50	62	40	43	32	9	— 2	43	22	26	16	34	14	52	38	74	59	71	46
21	76	61	64	47	62	53	65	49	42	34	14	— 5	28	16	41	22	44	27	39	32	67	46	67	53
22	75	48	72	48	68	55	67	58	47	33	26	9	28	19	47	29	46	35	62	33	63	50	66	50
23	66	56	73	55	69	48	72	60	46	38	22	12	29	16	41	30	51	34	73	37	57	45	75	43
24	76	55	77	50	66	50	67	50	40	30	15	6	25	5	38	30	37	28	74	44	59	42	82	44
25	66	53	85	50	70	53	51	44	38	25	14	1	5	— 5	33	27	48	28	62	45	55	42	82	64
26	69	49	75	58	60	51	48	40	30	18	25	8	29	1	33	27	48	36	60	38	58	45	70	55
27	76	47	64	55	57	44	42	35	36	21	30	16	37	18	30	19	53	37	63	38	67	43	74	47
28	76	62	66	46	62	45	37	27	40	27	28	16	25	2	35	10	40	28	58	36	78	47	79	50
29	73	63	72	45	59	53	38	24	33	26	21	3	35	24	.....	.....	33	23	63	43	82	51	76	55
30	80	54	75	49	61	41	45	22	27	10	22	15	36	22	.....	.....	42	24	61	45	82	52	80	57
31	82	63	84	50	.....	.....	52	37	.....	.....	20	13	40	18	.....	.....	47	26	.....	.....	81	53	.....	.....
Range	47°		52°		45°		50°		50°		57°		59°		41°		53°		52°		51°		45°	
Monthly means	73°.0		71°.9		58°.1		41°.3		37°.4		17°.6		16°.8		29°.8		30°.7		45°.3		56°.4		67°.9	

Maximum, minimum, and mean temperatures—Continued.

STATION, CAIRO, ILL.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	87	70	87	67	85	74	52	43	77	62	27	11	26	17	71	51	55	40	71	45	64	43	83	70
2	80	68	86	68	79	63	65	40	68	47	26	9	24	12	62	47	54	40	48	34	59	45	79	67
3	89	70	86	69	81	61	66	47	53	41	29	11	29	0	53	40	65	30	57	35	71	48	76	65
4	91	75	77	68	80	66	56	47	53	37	30	16	38	18	51	37	35	17	65	45	53	44	83	68
5	84	72	84	69	84	68	53	47	69	44	41	19	45	33	54	32	43	28	73	45	61	49	74	65
6	92	71	88	72	86	71	71	50	59	45	52	28	40	35	50	32	54	28	64	55	65	49	80	63
7	90	75	80	73	91	74	58	41	45	32	48	30	41	22	56	32	54	39	62	52	59	51	82	69
8	88	75	83	70	92	73	64	42	42	28	45	11	22	6	56	34	57	23	59	45	64	47	76	68
9	88	74	85	70	91	73	64	40	50	37	15	0	22	— 4	53	38	25	14	46	41	68	46	73	55
10	84	73	81	73	76	65	67	45	55	30	36	12	43	20	58	32	40	17	51	44	70	50	73	50
11	91	75	79	71	72	61	58	37	68	39	53	22	51	39	60	37	52	33	61	48	73	57	78	58
12	91	75	80	72	73	58	63	37	71	53	57	31	49	24	49	38	54	43	63	52	75	55	77	59
13	87	74	82	73	77	61	74	44	69	43	60	42	30	17	38	32	43	35	64	51	66	61	86	64
14	92	72	88	72	70	57	60	42	44	37	46	25	34	26	43	33	40	31	69	47	79	63	83	70
15	93	74	91	75	69	56	51	32	40	34	37	13	56	32	46	38	46	25	77	50	60	62	75	69
16	91	75	91	76	74	54	62	32	42	38	32	12	43	23	48	37	72	34	80	58	80	65	87	71
17	93	76	91	75	76	53	69	36	46	39	49	18	40	24	57	28	40	26	70	61	83	68	89	69
18	96	78	90	75	78	54	76	48	46	32	26	7	45	30	64	32	62	28	65	58	86	65	90	72
19	97	80	95	75	82	59	73	54	33	22	39	11	45	34	57	37	71	49	60	55	85	63	91	72
20	95	80	89	73	76	65	77	60	46	29	42	19	45	25	47	25	73	40	56	52	85	70	89	71
21	92	78	88	70	75	61	67	51	53	38	44	26	35	20	60	29	55	34	68	49	89	66	94	75
22	90	72	92	70	77	64	61	57	44	29	44	29	37	30	48	41	67	38	80	55	84	66	81	67
23	84	70	92	75	83	64	64	49	48	30	29	15	35	21	46	40	59	43	80	62	74	59	85	63
24	72	61	92	78	84	65	65	49	57	32	26	19	33	24	41	33	43	31	68	57	71	54	85	71
25	81	63	82	72	88	67	64	39	48	33	52	18	37	22	35	30	33	28	67	55	71	51	88	74
26	86	63	81	64	73	58	63	45	48	33	23	18	48	30	47	29	56	27	63	55	74	53	88	67
27	80	73	82	63	70	47	80	49	48	37	22	20	53	32	53	32	58	37	71	59	76	55	82	70
28	92	73	84	63	73	50	78	62	46	31	25	20	60	29	54	35	46	37	65	48	80	56	84	69
29	89	73	87	67	63	50	83	65	41	31	22	14	62	34	.....	.....	53	33	56	43	80	65	89	72
30	83	68	91	73	54	42	82	62	31	19	21	0	66	43	.....	.....	66	48	55	40	83	65	93	78
31	86	69	88	72	.....	.....	80	60	.....	.....	25	10	67	53	.....	.....	78	61	.....	.....	84	68	.....	.....
Range	36°		32°		50°		51°		58°		60°		71°		46°		64°		46°		46°		43°	
Monthly means	79°.9		77°.5		68°.6		56°.1		43°.8		27°.5		34°.3		43°.6		44°.1		57°.7		65°.7		75°.1	

Maximum, minimum, and mean temperatures—Continued.

STATION, CAPE HATTERAS, N. C.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	83	75	80	71	84	77	68	59	70	61	35	27	59	29	61	46	47	39	66	46	63	51	72	62
2	84	77	84	71	82	72	62	57	71	61	34	22	37	27	59	49	64	44	64	54	54	46	72	62
3	84	77	84	75	76	72	65	52	73	66	36	29	30	22	58	47	57	50	56	42	58	46	76	65
4	84	77	83	75	77	68	72	60	69	52	36	32	30	22	58	44	61	49	49	41	63	51	79	69
5	84	76	83	73	78	68	74	66	58	52	36	32	34	21	55	44	50	39	54	44	68	53	76	69
6	83	71	84	70	77	69	76	69	66	55	41	32	35	34	47	40	41	37	61	50	60	48	78	68
7	86	75	85	76	83	74	75	63	66	56	48	39	35	42	56	42	55	36	55	47	59	47	78	65
8	84	75	85	77	84	75	63	56	57	53	48	39	51	37	56	41	65	49	59	47	64	51	79	68
9	85	76	84	74	81	74	66	54	53	49	47	22	52	32	45	40	66	44	65	53	53	48	80	71
10	88	77	84	72	80	69	71	63	54	50	43	18	38	34	48	40	44	31	53	43	57	46	80	72
11	86	78	81	73	82	69	65	57	52	47	55	33	48	31	49	41	43	32	52	43	61	48	79	70
12	85	76	84	71	77	71	63	55	54	46	51	43	54	47	60	41	60	38	60	44	58	53	77	69
13	84	73	82	74	75	70	66	62	62	52	56	38	55	50	54	33	67	53	54	48	59	54	81	70
14	81	74	81	71	76	68	69	62	67	55	55	47	53	44	37	30	61	51	58	42	69	56	82	72
15	84	74	82	74	75	66	66	42	64	53	55	39	59	46	47	36	53	39	51	39	69	55	81	73
16	82	73	83	76	76	69	49	42	57	52	50	37	60	56	50	44	60	38	60	41	69	60	79	73
17	82	76	86	73	82	70	62	45	55	52	49	40	56	48	47	38	65	44	60	52	70	60	81	71
18	84	73	84	79	79	73	81	54	56	52	60	36	48	44	47	35	44	34	62	52	71	63	81	73
19	87	78	85	76	77	69	70	55	62	52	37	25	47	42	55	44	59	37	63	55	73	64	81	74
20	86	77	84	74	76	67	68	65	62	43	45	29	60	46	44	33	52	45	63	57	75	66	84	73
21	84	74	80	71	80	72	67	64	53	50	46	37	57	47	51	33	67	56	61	51	74	66	85	75
22	81	74	76	64	77	70	65	60	59	44	58	40	53	39	60	43	59	47	59	50	79	68	81	70
23	84	73	81	62	79	73	72	56	61	46	56	39	44	38	61	49	55	44	63	40	75	63	74	69
24	78	70	81	74	76	69	68	60	51	42	41	32	45	35	55	46	70	44	71	49	66	55	76	67
25	75	67	82	71	78	66	62	57	45	39	50	37	36	29	50	42	62	54	65	51	59	53	81	71
26	77	66	81	75	76	65	59	51	48	41	37	34	45	31	47	40	66	53	62	54	63	51	83	72
27	79	71	79	72	68	59	53	47	58	34	40	35	56	43	42	36	53	46	68	58	70	51	84	71
28	84	72	77	64	68	57	61	44	53	42	43	38	49	40	45	34	56	45	72	62	65	60	78	70
29	85	72	79	64	70	63	62	55	49	42	58	40	50	34	.....	.....	56	44	68	63	64	58	73	67
30	85	77	82	69	76	61	64	60	50	35	40	29	51	43	.....	.....	52	42	70	60	66	59	80	65
31	78	72	83	75	.....	.....	72	60	.....	.....	34	27	55	42	.....	.....	49	43	.....	.....	66	59	.....	.....
Range	22°		23°		27°		34°		39°		42°		39°		31°		39°		33°		33°		23°	
Monthly means	79°. 2		78°. 2		73°. 1		61°. 3		53°. 7		40°. 2		43°. 6		45°. 8		51°. 2		55°. 2		60°. 7		74°. 9	

Maximum, minimum, and mean temperatures—Continued.

STATION, CAPE HENRY, VA.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	87	73	76	69	88	74	63	.....	73	57	33	25	38	26	70	47	52	33	60	44	56	47	76	58
2	93	76	82	71	80	73	63	.....	81	61	33	22	31	23	70	51	60	40	62	49	54	43	81	59
3	94	77	82	73	74	67	68	.....	74	55	39	29	30	18	62	40	58	43	49	39	58	44	89	67
4	95	75	82	74	85	63	76	54	57	51	39	32	28	20	44	40	67	43	45	41	58	47	83	69
5	93	77	81	76	78	67	76	57	59	50	35	31	40	18	42	39	44	31	51	43	53	50	86	69
6	90	77	82	74	73	66	78	65	63	52	45	32	44	25	49	39	43	33	60	44	53	49	88	66
7	86	74	84	73	85	70	70	57	63	52	50	35	54	33	61	39	63	34	55	46	55	43	78	62
8	93	71	86	74	89	72	58	33	54	49	(†)	36	51	32	48	37	69	38	48	42	53	48	85	67
9	94	78	86	74	80	72	61	53	56	46	.....	15	32	22	44	36	67	35	46	38	54	46	87	70
10	95	80	82	74	75	69	66	60	52	46	.....	12	31	24	41	35	37	27	43	41	59	44	84	68
11	97	76	83	72	78	69	60	51	58	44	.....	25	45	23	54	36	46	27	54	40	59	47	68	59
12	95	79	83	74	70	68	55	49	57	43	.....	35	53	34	67	38	64	35	58	43	55	51	65	62
13	94	77	82	75	74	67	62	52	70	49	.....	36	57	37	42	30	66	43	48	42	59	51	72	65
14	94	76	82	75	75	66	68	51	73	55	.....	46	40	35	37.5	26	48	42	47	41	63	53	79	68
15	89	76	81	73	78	67	62	39	64	50	54	30	61	36	46	32	48	34	53	40	74	56	81	71
16	83	76	89	74	72	66	53	39	53	46	50	26	68	43	46	36	57	36	67	41	83	61	84	72
17	84	73	91	76	76	68	67	40	50	46	39	20	43	35	46	35	57	30	77	50	80	63	83	71
18	84	70	82	78	79	(*)	58	47	56	49	40	23	37	34	48	33	34	28	69	56	87	66	77	69
19	93	73	85	76	79	.....	62	43	60	51	37	21	42	35	63	37	54	32	72	60	87	69	90	73
20	99	78	84	75	80	.....	65	58	56	40	36	25	70	38	38	29	49	30	75	57	91	66	80	70
21	88	74	79	67	72	.....	65	60	52	46	40	39	56	34	57	29	68	42	63	48	89	69	84	(*)
22	82	71	78	68	71	.....	62	56	56	43	49	33	37	32	58	39	55	42	60	50	89	68	82	.....
23	90	73	84	67	73	.....	67	56	57	42	46	32	36	32	49	38	54	43	65	46	70	60	69	.....
24	75	67	79	71	73	.....	67	55	46	38	33	25	42	28	55	41	59	45	75	54	63	54	76	.....
25	78	66	88	71	68	.....	64	50	47	35	38	26	40	22	48	39	55	46	65	54	64	52	90	.....
26	81	63	83	71	79	.....	58	41	46	34	34	31	51	28	46	37	61	46	58	49	68	56	88	.....
27	78	68	80	73	68	.....	56	46	58	30	37	31	56	31	42	36	52	42	57	49	73	55	85	71
28	85	68	82	67	66	.....	68	41	45	39	35	31	43	32	49	30	56	41	72	56	64	55	73	69
29	82	72	85	64	71	.....	60	55	46	41	56	35	56	31	.....	.....	54	39	73	65	64	52	72	66
30	84	72	88	67	77	.....	59	54	43	33	37.5	27	51	37	.....	.....	53	39	65	53	64	58	84	61
31	75	71	88	71	.....	.....	62	57	.....	.....	35	23	50	33	.....	.....	46	41	.....	.....	73	55	.....	.....
Range	36°		27°		.....		39°		51°		.....		52°		44°		42°		39°		48°		.....	
Monthly means	79°.4		77°.1		70°.4		57°.7		50°.6		34°.8		37°.6		42°.4		45°.9		53°.2		61°.0		73°.0	

* Minimum thermometer broken.

† Maximum thermometer broken.

Maximum, minimum, and mean temperatures—Continued.

STATION, CAPE LOOKOUT, N. C.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	85	78	82	71	86	79	74	54	72	68	37	26	45	29	62	48	56	41	66	48	65	52	74	64
2	85	78	85	75	89	74	65	49	74	63	36	21	39	26	59	49	63	53	63	56	57	43	75	64
3	86	80	85	78	78	68	67	48	74	67	40	25	33	18	61	50	59	49	58	45	62	43	77	68
4	85	77	85	76	78	66	75	63	68	53	40	27	32	18	53	43	59	52	52	45	67	58	78	71
5	86	80	85	76	84	68	74	67	61	49	38	27	43	22	58	46	55	38	56	44	70	60	76	70
6	86	80	85	78	81	73	76	69	70	52	46	26	53	34	54	46	45	36	64	52	63	53	79	71
7	88	76	86	78	84	75	75	62	68	55	51	43	53	45	56	44	55	42	58	49	63	50	76	67
8	84	75	88	76	85	77	65	54	57	50	51	40	51	40	53	43	62	53	63	52	65	54	81	69
9	87	79	83	74	87	78	62	50	58	43	46	20	50	26	47	38	64	42	60	44	59	47	82	73
10	89	81	83	77	79	72	67	58	57	46	35	15	41	20	47	37	42	28	48	43	63	49	82	73
11	88	81	83	72	81	74	65	51	55	42	54	30	49	28	55	41	46	32	56	39	68	58	79	75
12	87	81	83	73	79	70	61	50	61	45	52	44	55	42	57	40	60	39	64	46	65	58	74	69
13	88	80	83	75	77	71	66	54	64	59	58	44	53	47	49	36	59	34	59	51	64	58	77	70
14	87	80	80	73	78	69	73	56	65	54	56	50	53	46	39	30	60	49	53	44	64	58	79	69
15	87	75	83	74	76	71	67	39	66	55	54	41	62	45	48	34	53	43	56	38	69	58	81	74
16	85	73	86	76	77	67	54	36	57	49	53	37	60	52	52	42	58	40	50	43	73	62	81	72
17	85	77	86	77	(*)	(*)	63	46	54	49	45	33	56	47	48	40	66	42	65	55	71	64	81	71
18	84	77	86	77	.....	.....	63	49	58	48	54	33	47	43	48	31	46	29	68	57	74	64	83	74
19	88	79	91	76	.....	.....	71	52	65	50	48	28	50	43	54	45	59	40	65	57	73	66	82	74
20	87	80	89	79	.....	.....	70	63	62	44	47	27	59	48	44	33	57	48	67	62	75	66	84	76
21	87	76	83	75	.....	.....	75	60	61	47	50	35	60	47	51	33	63	48	62	54	76	69	85	74
22	80	74	78	69	.....	.....	67	62	64	47	58	45	57	40	56	46	57	45	71	51	77	69	84	72
23	87	77	84	73	.....	.....	75	63	66	49	54	41	43	37	61	49	66	45	66	54	77	67	76	69
24	81	70	82	77	.....	.....	69	59	53	39	41	32	48	33	53	47	68	52	72	57	70	59	79	70
25	74	67	84	77	.....	.....	66	54	48	40	40	33	42	29	55	42	64	56	69	60	63	52	83	73
26	78	70	82	75	.....	.....	63	47	51	36	39	33	49	38	50	38	63	51	69	60	69	55	88	76
27	82	71	80	72	70	57	66	43	60	35	42	33	55	44	47	36	56	44	73	60	71	58	88	75
28	85	75	78	68	70	55	64	45	56	44	47	34	49	38	53	37	59	45	74	63	70	58	84	70
29	86	78	81	67	71	62	66	61	46	42	54	35	56	34	.....	.....	59	44	68	64	71	60	79	69
30	85	78	84	75	79	60	68	59	49	35	37	29	56	43	.....	.....	63	44	69	58	73	61	83	71
31	80	74	85	78	.....	.....	74	57	.....	.....	36	24	55	39	.....	.....	56	45	.....	.....	72	60	.....	.....
Range	22°		24°		.....		40°		39°		43°		44°		32°		40°		36°		34°		24°	
Monthly means	80°.4		79°.6		.....		62°.7		55°.1		40°.3		44°.7		47°.1		52°.2		56°.3		63°.9		76°.0	

* Maximum and minimum thermometers broken.

Maximum, minimum, and mean temperatures—Continued.

STATION, CAPE MAY, N. J.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	85	73	72	65	84	74	59	50	65	52	28	20	29	20	51	40	46	36	49	41	52	45	77	63
2	83	72	75	68	78	71	62	53	68	60	32	21	26	19	49	45	50	41	52	41	51	44	77	63
3	83	74	82	70	76	59	65	55	65	51	34	30	21	15	45	35	49	42	45	32	56	45	80	66
4	84	71	79	72	83	68	63	56	52	47	31	26	20	12	44	36	49	37	43	38	63	47	77	66
5	81	70	83	72	75	61	64	52	51	45	32	26	34	17	42	34	37	29	42	37	57	49	72	66
6	83	73	84	71	71	55	73	61	59	40	45	28	44	32	38	35	42	28	51	40	59	45	70	64
7	83	70	83	73	69	65	61	52	50	48	48	37	46	38	46	35	51	39	53	42	60	47	74	64
8	89	70	83	73	79	68	58	49	50	44	44	36	47	30	39	33	52	42	47	33	53	47	78	35
9	87	74	86	73	74	66	62	44	51	46	43	10	30	16	40	25	55	30	44	39	49	44	74	66
10	84	71	85	74	69	61	70	60	49	41	36	8	30	18	42	25	31	24	49	38	54	45	70	65
11	79	70	85	72	66	62	62	43	47	41	37	29	40	23	47	35	41	22	53	40	56	45	64	56
12	84	71	85	74	69	58	62	37	52	41	38	28	40	34	50	34	48	38	53	40	64	48	66	58
13	85	73	85	73	73	56	64	45	62	48	56	37	38	31	34	23	49	40	44	38	64	51	73	56
14	86	73	85	72	76	65	69	57	59	53	55	45	35	31	36	20	45	38	45	36	66	52	72	64
15	80	74	85	75	72	64	59	34	56	44	51	27	39	32	42	29	40	27	54	36	71	54	74	64
16	84	69	87	76	68	60	51	38	46	40	44	13	45	36	46	38	45	29	54	42	73	58	72	67
17	83	71	85	77	74	67	56	46	55	41	26	10	37	32	39	29	45	23	57	46	77	61	79	67
18	83	70	80	71	74	68	59	43	57	53	33	20	35	29	38	27	28	20	55	48	76	62	78	65
19	84	72	78	74	73	65	61	50	58	54	33	18	39	32	42	27	35	13	53	47	75	62	85	65
20	81	70	81	67	70	64	66	59	60	46	24	19	49	36	34	23	38	23	58	48	79	59	75	66
21	62	72	71	57	69	63	65	59	49	44	27	18	40	29	46	32	49	36	50	45	75	60	75	65
22	86	67	79	58	68	62	64	57	55	47	43	26	30	27	52	37	47	39	57	46	71	61	72	63
23	78	67	81	71	70	66	63	57	52	42	34	27	32	27	49	40	51	39	66	44	72	58	74	55
24	78	64	83	71	70	63	61	55	42	38	30	21	31	23	45	36	52	42	71	48	62	49	74	55
25	79	65	82	74	65	50	58	47	42	36	37	22	30	21	40	35	51	43	61	52	60	50	88	56
26	74	66	78	73	70	58	49	46	47	37	40	30	41	27	38	34	53	43	59	48	66	54	83	71
27	78	66	73	68	62	55	48	44	46	37	31	28	45	34	43	33	48	36	53	50	68	56	75	69
28	75	67	78	69	66	56	59	40	46	38	35	25	40	30	47	35	40	33	55	50	67	54	71	64
29	78	69	81	70	70	62	51	44	42	37	48	32	43	34	.....	.....	37	32	62	51	69	57	78	57
20	76	69	80	74	64	53	59	40	38	28	40	26	44	32	.....	.....	46	35	56	49	72	57	75	61
31	77	65	82	74	.....	.....	63	56	.....	.....	27	23	46	32	.....	.....	47	34	.....	.....	78	61	.....	.....
Range	25°		30°		31°		39°		40°		48°		37°		32°		42°		39°		35°		33°	
Monthly means	75°.0		76°.2		67°.3		55°.6		48°.3		30°.1		32°.0		37°.4		39°.0		47°.8		58°.6		69°.5	

Maximum, minimum, and mean temperatures—Continued.

STATION, CHARLESTON, S. C.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	91	78	88	73	94	79	68	53	76	59	39	28	47	35	68	49	62	47	68	55	80	52	78	63
2	91	80	88	73	92	77	63	48	78	62	38	23	44	29	70	50	64	56	70	60	70	50	83	64
3	92	80	88	76	84	72	69	50	79	65	44	27	44	26	67	56	65	49	66	56	75	55	88	67
4	92	80	87	79	84	74	75	57	67	53	44	29	40	29	60	51	74	54	57	52	76	62	87	70
5	92	79	88	78	86	72	77	67	64	54	42	30	50	31	56	48	63	45	70	50	78	62	85	72
6	93	79	91	77	87	76	82	69	66	53	47	28	58	46	59	47	52	39	71	62	72	63	92	71
7	95	77	86	78	88	77	79	69	70	58	56	40	52	44	56	48	60	45	69	60	78	61	89	69
8	94	77	91	75	91	76	70	58	58	50	50	45	57	39	62	48	70	53	70	59	73	56	88	75
9	96	77	90	77	92	77	58	51	58	44	45	35	54	36	58	43	66	41	60	50	71	52	68	77
10	97	80	91	79	89	78	63	57	55	42	46	31	49	31	54	38	49	32	51	44	70	56	87	75
11	93	83	91	78	87	70	68	60	58	39	65	40	54	38	64	43	53	41	59	44	71	56	81	73
12	93	81	88	77	84	71	60	49	66	46	62	49	71	46	64	47	69	47	64	48	72	57	78	69
13	94	82	88	76	84	73	67	53	70	49	62	43	70	56	53	44	74	58	65	50	72	65	84	72
14	95	82	88	72	82	75	68	57	71	52	60	52	71	58	47	37	65	58	61	43	75	63	83	74
15	97	82	87	75	85	70	68	49	74	57	58	48	69	59	50	35	61	52	61	46	75	61	85	75
16	96	76	89	75	74	69	59	43	65	55	59	35	68	58	55	46	66	48	69	51	77	63	88	75
17	87	77	89	79	77	65	64	44	60	52	54	39	68	55	54	43	68	47	73	57	76	62	88	76
18	87	76	94	78	84	66	69	49	61	50	63	41	60	53	54	37	57	37	74	60	76	64	89	77
19	97	77	97	80	85	68	71	60	65	48	48	26	59	53	64	45	64	46	69	64	80	69	89	76
20	92	79	95	80	84	70	69	65	60	40	53	34	68	56	55	41	69	53	77	63	85	71	93	76
21	92	75	87	78	81	76	79	64	61	46	56	40	69	55	62	35	71	59	73	62	86	73	91	73
22	89	72	84	76	82	72	76	63	69	49	61	51	67	49	62	43	59	46	72	55	90	74	92	76
23	94	77	85	74	84	71	74	60	66	49	60	48	49	42	63	50	68	44	78	64	86	72	82	76
24	93	74	84	74	84	69	70	53	54	42	46	37	54	38	61	44	72	52	85	60	80	68	84	76
25	75	68	86	74	81	70	70	54	53	44	39	33	49	33	59	41	64	59	84	63	72	69	96	74
26	82	67	89	76	86	70	65	47	55	38	43	35	57	45	54	40	59	45	81	67	71	58	100	80
27	83	72	86	75	76	64	62	48	61	45	49	39	63	47	55	44	66	47	80	65	73	60	97	81
28	90	77	85	77	74	66	65	48	66	53	47	39	57	43	59	44	71	49	79	67	72	65	91	70
29	89	79	84	72	77	62	74	52	55	47	57	33	61	41	.....	.....	67	47	77	68	76	62	83	70
30	90	74	87	74	82	64	76	58	50	36	40	28	64	45	.....	.....	60	47	74	62	76	61	89	74
31	85	73	92	76	.....	.....	73	59	.....	.....	44	28	61	45	.....	.....	63	48	.....	.....	78	62	.....	.....
Range	30°		25°		34°		39°		43°		42°		45°		35°		42°		42°		40°		37°	
Monthly means	83°.6		82°.4		77°.9		62°.4		56°.3		44°.1		51°.2		51°.7		56°.8		63°.0		68°.8		80°.2	

Maximum, minimum, and mean temperatures—Continued.

STATION, CHARLOTTETOWN, PRINCE EDWARD ISLAND.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	66 5	54.9	73.4	56.7	65.4	47	54	47	42	34.6	35.6	19.2	16.7	6.2	29.5	17.9	26.6	14.1	32.2	24.9	48.4	38.9	64	43.1
2	63.8	53.5	73.9	57	67	56	56.4	46.7	44.6	37.9	35.7	31.6	26.6	8.5	30	16.9	29	6.1	33	24.9	47.7	34.6	71.3	48.1
3	69	55.8	69.3	59	63.6	53	54	38.5	53	38.8	34.4	29.6	25.6	— 2.2	26.5	17.1	39	25.1	34.2	24 1	45.2	34.1	79	59.9
4	80.6	62.1	80.3	63.2	67.2	51.7	60	46.5	51.9	37.1	34.4	24.1	14.3	— 3.7	31.2	20.9	39.8	26.6	30.5	27.1	50.1	38.2	75.4	49.1
5	78	62.6	79.5	61.9	63	47.5	60	48.4	38.1	33.1	30	20.8	20.4	13	33.7	22.1	34.2	19.6	44	29.2	52.9	39	66.2	49.2
6	66	53.5	85	64.1	55	45.5	57	40	36	28.8	32.4	24.1	19.6	5	33.5	23.7	31	16.1	49.5	34.6	54	35.1	72.6	51.8
7	75.1	59	81.4	66.5	56	45	57.5	46	44	30.3	35.1	27.6	38	12.1	29	23.9	29.8	8.7	44	33.7	39	33.1	73.5	53.9
8	68	54.1	83.7	68.1	57.7	41	48	40.1	54.9	43	31.1	16.1	36.8	27.2	27.7	16.3	28.1	13	35.1	30.6	38.1	34.3	73.3	55.3
9	63	51.7	80.1	63.6	53	40.5	45	37.1	57	43.1	28.2	15.6	38.8	1.2	21.9	14.1	47	26.1	37.1	31	43	34.3	73.8	54
10	66.3	50	86	64.7	51	45	53.3	33.6	44	39.1	21.9	9.3	6.8	— 4.9	17.4	4.6	43	19.7	34.7	30.8	39.9	34.1	72.1	56.4
11	68	57	88	67.5	63	44.5	53.1	38.1	49.1	40.1	10.7	0.3	22.3	4.6	20.5	— 2.4	28.1	16.1	38	28.9	36.9	31.9	71.1	57.2
12	78	57.4	83.9	65	56.8	48.7	43.4	35.8	48.9	41.1	30.5	7.2	22.2	— 5.9	30.8	1.3	32.3	17.2	34.8	27.1	54	31.6	69.5	54.9
13	81	64	81.2	63	60.2	44.5	53.7	34.6	46.5	42.1	32.4	22.9	6	— 5.7	33	22.3	28.3	14.5	33.6	27.3	60	33.2	69.5	55.2
14	70.8	60	80.9	63.1	65.2	46.8	42	29.4	43.1	37.1	32.1	26.1	18.9	— 8.4	23.7	11.8	29.4	13.1	47.9	27.1	60	38.1	73.2	53.7
15	72	60.5	84	66	63	52.8	54.9	39.2	38	32.6	37.4	15.9	5.5	—13.6	26.3	12.2	33.6	22.1	51	28.1	48.9	39.1	71.6	54.3
16	73	56.1	72.9	51.5	58.8	41.8	42	33.1	35	30.3	35	— 4.1	9.4	— 3.9	30	15.6	28.1	14.1	44.4	28.1	53.8	37.3	68.1	55
17	74	53.2	65.7	51.6	58	44.2	44	36.1	31.9	26.9	— 2.1	—12.9	4.9	—12.8	41.5	26.1	21.2	11.1	47.5	27.3	60	38.1	69	52.4
18	77.3	63.5	70	56.2	62.2	43	40.1	34.3	32.1	28	25.6	— 7.9	20.1	— 0.8	33.4	22.1	24	9.6	51	29.1	53.6	40.2	69.1	51.2
19	77	62	70.7	51	64.1	48	42.9	34.3	32	27.8	36.8	12.6	24	7.5	25.1	12.5	28	13.1	54	29.2	50.6	32.1	74.8	55
20	77.5	61	70.3	54	57	48.5	50.4	34.7	35.5	23.6	12	0.6	39	11.8	25.8	14.1	27	11.2	45.1	31.2	45	30.1	60.7	48.1
21	70.1	57.2	61	48.8	61.2	44	46	36.2	37	29.2	14.3	— 0.2	37.4	4.1	23.9	4.7	37.1	11.1	51	35.1	57	36.6	63	43.7
22	72	55.4	60.1	48	62.6	40.4	49.3	42	40.1	32.1	14.6	0.4	23.5	1.2	29.2	— 1.1	42.1	31.5	51	33.2	50	35.5	63.7	44.1
23	70.3	56.5	58.7	51.5	67.1	49.6	54.9	47.4	40.1	33.9	22.8	11.6	23.5	8.1	30	13.1	35.1	20.1	64.1	33.2	54.8	35.2	62.8	43.2
24	64.3	57.3	60.4	48	64	47.8	58	50.1	40	36.1	18	13.1	22.8	2.8	34.4	29.1	32.2	23.1	67.2	38.4	48	37.3	66	47.5
25	73	58	70	46	64.3	47.1	56	46.2	39	36.1	16.8	9.2	22.2	—10.3	34.1	30.6	26	18.1	64.9	37.2	50	38.2	64.1	52
26	74.9	57.7	71.2	61	59.4	46.7	50.5	40.6	37.1	32.6	21.8	9.6	0.1	—15.4	31.6	11.3	37	21.2	37.5	33.6	44	38.1	62	47.9
27	71.3	55	69.8	59.2	57	48.5	48	39.1	35	27.4	18.6	9.4	21	— 2.4	18	3.1	43	30.1	38.2	34.2	42	35.5	67	45.8
28	71.5	57.2	62.1	53.5	57	49	40.1	31.8	30.9	26.3	22	11.4	4.9	—21.7	24.4	9.1	52.5	40.6	41.3	30.3	66.4	32.4	73.4	46.9
29	70.7	60.2	60.9	49.1	62.5	47.5	41	30.9	31.8	24.1	18.2	11.8	16.5	—26.7	.....	.....	47.9	35.8	47.9	30	75.5	48.9	72	50.9
30	76	60	62.8	47	61.2	53	39.3	32.7	24.7	17.9	35.1	15.3	30.5	11.1	.....	.....	38.4	30.1	55.7	34.1	75.3	54.9	72.8	55.4
31	66.3	58.4	61.4	49.1	.....	.....	43	32.2	.....	.....	27.9	9.6	35	11.6	.....	.....	31.4	23	.....	.....	79.3	43.1	.....	.....
Range	31°		42°		26°.8		30°.6		39°.1		50°.3		75°.7		43°.9		46°.4		44°.3		49°.2		35°.9	
Monthly means	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, CHATHAM, NEW BRUNSWICK.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	69.3	53.8	81.6	55.5	63.3	47.1	55.3	43.1	52.3	32	34.1	15.9	19.4	— 2.3	25.4	18.4	31.4	8.8	37.3	12.9	49.1	36.5	74.3	40.8
2	66.3	52.1	84.3	51	66.1	54.2	58.3	40.1	44.9	36	36.3	30.3	17.9	— 0.5	24.4	16.9	33.4	— 6.3	40.5	11.4	48.7	35.8	80.3	42.4
3	71.8	54.1	91.3	56.2	63.1	50.2	61.3	34.8	47.1	37	34.6	27.7	13.8	— 2.1	33.4	18.5	46.3	27.5	42.3	28.1	40.1	35.5	85.1	55
4	84.3	63.7	88.1	59.4	68.8	45.9	66.5	42.5	41.5	31.7	35.3	19.9	13	— 5	38.5	20.3	42.3	24.5	34.4	12.9	52.3	34.8	62.3	47.9
5	81.8	62.1	93.7	62	64.7	44.6	57.3	38.6	41.3	26.9	33.2	19.9	26.4	— 2	38.3	22.2	36.3	9	34.1	24.5	51.9	34.8	73.1	48.5
6	68.3	52.1	92.1	64.5	54.3	40.1	47.3	33	42.8	23.2	34.4	22.4	21.9	—11.9	28.4	19.9	30.4	— 2.5	42.8	32.8	55.3	30.4	74.1	47.5
7	80.8	49.1	91.7	68.1	62.8	45.7	52.8	40.9	37.3	23.2	36.3	22.2	29.4	— 3.3	29.9	21.7	30.2	—12.4	41.3	32.8	39	33.8	71.9	50.9
8	81.3	61.5	85.5	60	64.3	35	44.3	35.1	44.3	34.8	23.9	6.7	32.1	20.4	30.4	11.4	22.2	— 0.3	37.8	31.9	38.1	32.4	69.3	49
9	67.3	55.1	91.5	59.5	59.7	38.1	46.8	29.1	42.5	34	21.4	0.7	37.1	—10.2	21.6	— 5.3	49.3	22.2	39.7	33	36.5	33	77.3	56.8
10	76.3	54.9	97.9	60.7	64.3	39.1	52.3	29.1	42.3	33	19.2	3.8	2.4	—21.8	27.6	— 6.3	45.1	6.8	40.3	33	41.3	32	76.5	58.5
11	82.3	58	97.5	65.2	68.8	39.9	48.3	35.8	42.3	37	13.9	—10.4	24.4	— 2	29.5	4.3	31.4	0.8	40.5	26.9	49.9	31.8	76.5	50.6
12	90.3	54.6	93.3	63.3	65.1	42.6	46.3	31	43.3	38.5	25.2	—10.4	20.8	—13.4	31.6	5.2	36.3	4.2	39.8	26.9	66.5	30.4	61.1	43.6
13	86	63.5	93.9	63.3	67.3	37.9	48.3	28.6	43.1	34.2	26.4	7.8	4.9	—10.3	35.3	11	23.2	4.8	48.1	23.9	73.5	31.8	79.3	48.2
14	79.7	57.4	93.1	65.3	73.1	38.5	40.1	25.5	42.3	35	31.4	14.9	16.4	—14.3	24.6	3	29.2	0.5	55.5	25.3	69.3	34.8	78.8	54
15	74.3	56	89.3	64.5	63.5	50.2	46.1	33.1	36.3	26.2	31.4	8.6	— 2.5	—29.6	34.4	0.7	29.4	18.9	54.3	22.9	64.3	39.1	79.8	50.8
16	73.5	53.2	69.3	51.6	59.3	32	34.3	31	39.3	21.9	16.4	—12.3	— 2.4	—17.3	30.7	— 5.7	27.2	0.5	53.3	22.5	59.1	37	71.1	59.8
17	83.1	50.5	73.8	50.2	64.5	32	40.7	31	33.4	19.9	2.2	—15.5	12.4	—21.5	29.6	18.4	17.9	— 6.3	58.5	22.9	55.3	36	72.5	55.1
18	88.3	65	76.3	50.1	62.5	37.9	44.5	30	37.9	22.9	17.3	—15.5	21.4	—10.8	26.2	10.5	8.7	0.5	53.1	27.3	61.1	44.9	79.3	51.6
19	76.8	57.6	76.3	48.1	58.3	47.6	50.3	29	34.4	17.9	29.4	3	22.9	— 4.3	20.4	— 7.3	19.8	7.8	51.4	26.9	62.3	36.6	78.3	51.1
20	87.3	56.5	61.3	49.7	61.3	49.1	57.3	31	32.4	22.8	8.4	— 5.3	38.8	6.3	25.5	0	33.4	— 6.3	38.5	32	58.5	31	65.3	43.9
21	78.7	58	61.3	45.9	61.1	41.1	55.1	30.1	37.8	28	7.9	—12.8	31.4	—11.4	30.2	—13.6	40.1	2.8	43.3	32.3	63.3	32.4	63.3	42.8
22	74.3	49.1	60.3	46.9	73.3	37	51.3	38.1	37.3	32.8	9.4	—16.7	20.4	— 7.1	41.3	— 2.3	45.1	28.6	65.4	34	62.5	31.8	58.5	44.1
23	65.3	56.1	65.7	46.1	76.3	45.1	54.3	48.1	36.8	31	15.4	— 7.5	24.4	— 8.3	38.4	3.8	32.2	20.9	76.8	31.4	62.3	32	66.5	42
24	61.5	54.9	73.3	45.6	70.9	40.1	62.5	48.5	36.7	32.9	22.9	7.8	13.3	—11.9	36.5	22.9	40.3	19.2	77.9	34.6	44.1	36	70.8	42
25	77.5	55.4	79.3	43.1	72.9	41.5	60.3	44.1	36.3	31.3	20.4	— 0.3	13.9	—17.3	34.4	26.9	30.6	8.2	73.4	36	46.3	40	63.4	42
26	72.3	52.6	79.7	53.9	67.8	48.6	50.3	34	39.1	28.7	29.2	— 5.8	6.4	—24.5	37.8	13.8	42.1	22.9	45.3	38	45.1	41	70.3	42
27	74.3	51.1	72.8	51	56.3	44.3	47.3	33	36.3	21.9	16.9	—10.4	14.4	— 2	27.9	— 0.3	40.5	29.1	58.5	33.5	58.3	37.5	71.1	41.9
28	75.5	51.8	62.9	45.1	56.3	41.9	37.3	30.5	29.6	22.9	25.4	0.4	14.4	—19.3	36.3	8.6	43.3	35	65.1	33.2	80.3	34.5	77.5	48.5
29	68.3	59.2	66.1	47.9	67.3	40.1	42.3	27.9	30.6	21.2	25.2	— 2.5	27.4	—19.3	.....	.....	48.2	34	48.5	33	87.1	48.6	79.3	48.2
30	83.3	58.2	64.1	47.1	66.3	52.2	45.1	30	22.2	16.1	30.4	—13.4	38.3	7.8	.....	.....	38.7	30.7	43.5	34	87.1	54	70.5	53.8
31	69.3	55.6	75.3	46.1	.....	.....	40.6	24.9	.....	.....	23.4	10	43.3	7.8	.....	.....	43.9	19.7	.....	.....	83.5	43.1	.....	.....
Range	41°.2		54°.8		44°.3		41°.6		36°.2		53°.0		72°.9		54°.9		61°.7		65°.5		56°.7		44°.6	
Monthly means																								

Maximum, minimum, and mean temperatures—Continued.

STATION, CHEYENNE, WYO.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	80	44	78	57	72	45	68	23	37	22	37	11	36	21	48	24	32	19	44	15	58	39	61	37
2	90	53	85	53	81	43	71	36	40	12	40	21	30	14	42	29	38	5	59	26	48	36	70	39
3	90	55	87	57	86	53	57	26	47	12	38	14	36	17	48	26	21	— 2	49	27	56	32	70	39
4	86	54	89	56	80	57	57	37	49	23	43	11	39	28	34	23	25	— 1	58	32	60	30	65	45
5	88	48	80	55	80	51	73	41	42	22	45	25	41	26	41	16	41	0	59	37	47	32	75	42
6	96	51	90	52	84	43	60	31	51	20	36	13	42	32	43	17	49	28	63	30	56	37	66	43
7	94	61	91	52	78	46	51	29	56	26	33	18	37	— 1	36	20	40	16	57	38	63	33	53	38
8	73	59	92	57	68	47	66	34	64	36	32	14	34	1	40	15	25	0	49	31	72	36	49	36
9	85	44	80	47	75	36	75	39	69	29	41	28	44	27	52	24	31	5	44	24	72	40	69	38
10	89	49	73	34	76	44	66	32	68	34	42	21	46	26	55	25	54	26	42	23	61	37	61	43
11	86	53	87	44	78	40	70	41	57	35	50	33	38	— 3	32	13	50	29	45	30	50	40	65	38
12	83	54	92	49	62	42	68	41	36	9	48	28	14	— 5	38	15	48	24	51	29	55	41	70	43
13	71	54	75	47	59	37	58	37	30	2	38	16	41	10	45	21	58	40	59	29	62	42	67	43
14	81	51	65	50	66	28	47	39	51	12	32	10	45	23	50	23	64	27	59	35	63	36	78	43
15	88	53	86	51	79	32	66	33	61	39	46	23	24	—10	37	25	67	44	66	32	70	41	72	38
16	89	59	84	53	71	51	68	35	51	28	53	16	35	1	47	23	48	32	61	37	61	42	85	45
17	83	60	89	57	63	43	60	37	45	18	38	9	33	12	56	18	55	31	44	32	68	42	86	47
18	89	56	83	53	68	42	60	37	54	12	47	7	42	7	50	28	62	34	46	29	62	41	75	50
19	81	54	77	56	62	39	49	32	60	37	46	19	41	10	53	20	63	26	63	29	54	40	87	50
20	85	52	72	53	77	34	42	27	44	17	36	15	30	8	58	21	50	25	67	33	64	37	78	49
21	91	55	83	52	79	47	44	26	36	8	36	23	24	9	48	26	62	30	56	36	68	36	81	48
22	90	52	68	47	74	49	56	33	29	10	28	— 2	13	14	44	22	58	34	39	18	61	49	85	49
23	84	58	81	42	76	37	58	33	47	11	— 1	—12	33	— 4	49	21	41	13	45	22	73	46	74	50
24	71	57	67	45	74	39	60	30	46	26	25	—14	45	7	55	23	46	8	32	26	72	46	75	42
25	86	56	78	41	74	43	65	31	50	35	9	—14	41	16	45	24	60	36	36	28	66	47	71	44
26	81	57	76	51	73	37	67	29	50	21	26	— 6	42	23	39	24	64	37	35	28	75	45	79	41
27	92	53	80	45	75	41	66	38	33	17	23	3	47	13	37	26	60	38	41	24	79	45	81	41
28	92	55	81	52	64	39	65	33	22	1	12	—11	45	20	46	28	55	32	34	16	78	47	81	49
29	92	50	79	45	57	27	55	33	18	3	31	— 6	50	25	.....	.....	59	33	47	9	81	45	75	56
30	90	56	83	48	57	28	42	26	31	0	34	15	43	32	.....	.....	61	35	59	25	60	42	79	49
31	87	56	74	51	.....	.....	47	27	.....	.....	28	5	46	34	.....	.....	40	21	.....	.....	50	39	.....	.....
Range	52°		58°		59°		52°		69°		67°		64°		45°		69°		58°		54°		55°	
Monthly means	72°. 3		66°. 5		57°. 3		46°. 9		33°. 2		23°. 4		25°. 0		31°. 6		35°. 9		38°. 2		50°. 8		59°. 0	

Maximum, minimum, and mean temperatures—Continued.

STATION, CHICAGO, ILL.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	67	62	80	66	78	62	54	37	64	50	18	11	24	6	55	41	43	34	64	34	42	35	83	69
2	78	62	77	62	67	51	65	41	51	39	26	9	16	1	48	38	40	30	34	27	47	33	85	62
3	86	67	82	71	74	58	54	47	49	40	32	23	14	2	40	37	30	17	46	29	55	40	80	65
4	80	67	84	72	69	62	50	38	49	38	33	20	22	2	39	35	30	5	66	40	57	45	69	56
5	84	67	81	69	64	60	59	34	56	40	35	15	33	20	46	32	24	10	50	32	56	46	65	54
6	90	68	84	70	73	58	51	42	51	36	40	27	38	23	50	35	42	9	46	37	53	43	68	53
7	93	78	79	65	69	63	56	34	40	34	30	18	33	7	41	34	33	21	48	37	52	43	82	60
8	93	77	77	69	70	64	46	33	44	35	19	− 5	7	− 3	39	33	31	17	46	38	51	42	76	67
9	93	78	80	72	67	60	64	37	46	37	2	−14	21	− 3	39	34	19	9	42	39	50	42	68	50
10	81	65	85	72	69	63	54	38	55	36	22	0	33	20	53	32	29	6	48	38	53	40	70	45
11	76	65	84	70	63	60	46	33	59	40	40	10	33	13	55	38	41	28	48	40	51	44	69	55
12	81	68	84	74	68	60	55	39	66	48	42	27	22	9	38	25	37	28	50	40	61	46	72	53
13	78	70	86	75	63	60	53	42	61	36	45	36	18	− 1	35	27	40	27	43	38	60	49	70	50
14	74	68	85	72	60	55	52	34	40	35	36	6	27	10	40	27	36	19	50	39	66	49	68	57
15	75	69	74	68	63	50	44	28	43	32	35	5	30	24	47	32	30	6	66	40	78	62	82	68
16	81	70	76	62	65	51	60	32	44	35	19	− 8	24	10	40	29	30	22	62	48	80	64	70	53
17	90	74	76	71	65	55	60	40	45	39	19	7	35	10	35	21	30	15	63	46	80	68	70	56
18	81	72	88	72	71	52	63	47	48	39	16	4	38	31	58	30	30	17	63	48	82	65	80	64
19	91	76	80	66	78	60	58	52	44	37	22	10	38	30	38	28	30	22	55	43	86	65	72	52
20	83	74	74	66	71	64	70	54	51	41	30	19	36	5	48	23	32	24	50	42	79	68	80	51
21	74	68	74	64	70	65	62	53	50	30	30	15	28	7	57	34	41	25	54	42	80	61	70	56
22	83	61	85	68	70	64	57	50	36	24	27	15	24	8	58	38	52	31	70	48	70	46	60	54
23	70	59	92	72	70	64	59	46	31	21	16	5	22	− 4	43	32	31	27	78	56	52	44	76	54
24	73	57	85	72	71	62	50	42	42	24	22	13	22	11	32	28	29	24	60	47	50	44	85	63
25	80	59	77	62	70	59	48	36	38	27	28	21	35	7	35	27	32	26	56	45	52	42	81	62
26	81	64	68	55	61	47	44	33	37	29	26	16	40	18	36	27	39	22	56	45	54	45	81	65
27	84	68	73	54	63	43	57	38	37	30	25	14	38	25	39	30	42	28	50	41	61	48	71	63
28	80	66	75	58	67	48	70	50	32	14	24	15	45	27	39	26	37	30	42	38	70	55	80	61
29	74	68	76	63	53	39	62	48	34	15	29	20	48	33	....	.....	34	30	43	36	81	56	86	67
30	75	66	82	68	49	37	73	54	27	15	22	11	50	43	....	.....	45	35	44	34	82	63	87	72
31	75	65	86	69	.....	.....	73	55	.....	.....	25	5	56	45	.....	.....	65	40	.....	.....	84	66	.....	.....
Range	36°		35°		41°		45°		52°		59°		60°		37°		60°		51°		53°		42°	
Monthly means	73°.2		73°.7		61°.5		49°.4		39°.2		19°.9		22°.2		36°.7		29°.5		45°.7		56°.8		65°.8	

Maximum, minimum, and mean temperatures—Continued.

STATION, CINCINNATI, OHIO.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	88	73	81	66	79	70	53	43	74	56	22	16	24	10	65	50	53	31	68	51	50	37.5	86	63
2	87	71	84	67	75	59	59	46	67	47	22	10	16	8	59	48	54	40	51	38	55	37	87	70
3	91	70	91	67	76	56	65	48	47	44	27	20	19	9	48	36	52	38	52	34	51	44	82	68
4	88	76	87	71	82	62	55	44	52	40	31	22	23	7	46	35	47	20	62	42	60	40	75	68
5	87	75	83	71	72	61	55	48	58	45	33	23	38	15	47	35	35	26	58	41	54	47	76	65
6	91	75	85	74	74	62	64	48	58	47	40	25	41	31	42	34	44	23	64	48	57	46	75	57
7	93	71	85	74	82	70	53	41	47	40	38	28	38	34	52	33	57	42	63	45	59	52	72	57
8	94	73	85	70	88	75	58	42	42	39	38	5	35	9	50	36	58	38	56	48	61	46	75	64
9	92	75	85	72	88	73	58	56	44	35	5	— 6	19	— 4	48	34	38	16	52	43	58	47	78	56
10	91	76	87	74	84	70	65	42	48	33	28	4	31	15	51	31	32	16	60	44	62	43.5	71	49
11	96	76	80	75	75	64	50	36	55	38	37	27	44	26	57	32	45	28	63	42	63	(*)	75	53
12	86	74	84	74	71	62	56	36	62	40	44	34	42	29	49	30	48	41	63	42	69	51	76	61
13	93	75	87	74	72	58	65	39	67	54	52	39	29	18	39	25	48	33	61	42	71	54	83	58
14	84	76	90	73	74	61	58	37	58	42	43	22	33	23	45	29	42	28	60	41	77	58	85	66
15	90	73	89	75	65	58	44	29	43	39	33	13	51	32	49	39	39	24	66	41	79	60	78	70
16	90	70	85	73	70	54	53	31	47	41	32	12	48	28	48	35	39	28	76	46	81	65	86	70
17	94	71	84	76	63	58	64	37	49	43	43	12	39	27	40	31	29	17	77	58	83	66	86	70
18	96	78	88	75	74	59	65	40	52	46	43	15	39	30	50	25	34	22	69	59	88	65	92	71.5
19	96	77	89	75	78	57	68	47	48	41	30	11	43	26	46	31	52	29	70	57	89	67	90	71
20	95.5	79	84	70	77	61	71	59	51	47	33	17	44	22	42	26	50	27	57	50	86	71	91	74
21	87	73	81	63	76	69	74	57	54	44	43	29	39	18	56	32	59	36	67	43	87	69	85	72
22	90	67	86	63	75	67	69	60	44	34	39	26	37	31	58	37	58	33	74	46	78	61	75	61
23	80	68	91	68	73	66	60	50	39	29	30	21	32	20	49	42	64	42	79	49	71	57	80	58
24	80	63	86	74	71	63	57	46	42	26	23	17	28	23	42	35	51	37	74	54	63	48	85	66
25	83	60	83	69	77	60	51	42	42	35	28	19	34	20	38	34	37	24	68	47	65	46	87	64
26	87	62	79	61	68	55	51	38	42	34	26	21	47	28	44	33	42	33	59	54	69	49	85	68.5
27	86.5	64	80	59	60	47	59	35	39	35	25	19	47	36	47	31	50	31	64	52	73	50	85	71.5
28	88	72	78	59	68	45	66	50	37	30	29	22	50	29	49	32	48	32	69	55	78	52	85	68
29	82	69	80	59	63	51	64	57	36	27	26	21	56	40	.....	.....	52	30	55	45	80	56	87	67
30	82	66	84	65	54	45	73	57	33	22	24	14	59	40	.....	.....	57	35	47	41	80	59	87	74
31	83	63	86	73	.....	.....	74	60	.....	.....	21	— 1	61	43	.....	.....	71	47	.....	.....	84	57	.....	.....
Range	36°		39°		43°		45°		52°		58°		65°		40°		55°		45°		.....		43°	
Monthly means	79°.4		77°.0		66°.8		59°.8		44°.2		25°.6		31°.4		41°.3		39°.4		55°.7		†63°.3		73°.9	

* No observation recorded. † Mean of 30 days.

Maximum, minimum, and mean temperatures—Continued.

STATION, CLEVELAND, OHIO.

Day of month.	1876. July.		August.		September.		October.		November.		December.		1877. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	82	62	76.8	63.6	73	64	51	41	71	59	22	17	21	10	53	43.5	44	23	68	39	39	33	87	59
2	88.2	67.1	82.5	64	68	53	60	41	69	46	31	22	19	9	48	37	59	33	38	27	46	36.5	78.5	67
3	84	65.9	76	61.7	73.2	49.4	58	43	46	39	30	27	13	9	39	32	45	33	31	21	50	32	76	65
4	78	64	82	66	70.2	56	51	37	45	37	31	24	18	9	34	28	42	21	47	29	53	40	70	62
5	86	62.8	76	67	64	45.9	53	40	51	35	30	18	30	14	32	25	28	20	47	34	59	43	68	56.5
6	82	60	82	67	69	49.9	58	42	59	41	34	22	39	26	36	31	38	17	48	32	58	44	63	54
7	88	69.1	77	68	76	57.7	46	40	41	35	34	22	34	26	38	32	39	24	40	29.5	60	44	71.5	54
8	86.2	71.5	79	60.6	73	62	48	37	42	35	29	11	26	12	35	25	49	28	40	35	52	44	85	62
9	88	72.5	78	55	68	59.1	52	30	42	33	11	— 5	13	— 3	34	21	28	11	51	33	52	42	77	61
10	87.5	72	85	60	67	55	51	39	38	30	10	— 5	24	11	49	24	26	9.5	45	33	52	41	62.5	49
11	80	70.3	86.2	66	66	58.7	43	30	43.5	32	32	10	36	22	58	36	39	21.5	48	34	54	43	72	50
12	83	69.5	79.2	66.7	76	51.2	48	26	57	31	38	31	22	5	48	22	38	28	49	31	59	40	73	54.5
13	81	68	84	66	68	46.9	55	30	64	46	45	35	20	3	22	16	33	27	41	31	59	44	82.5	55
14	80	67.8	85	66	73	52.4	52	31	48	36.5	40	20	21	14	43	17	36	23	48	33	70	40	85	66
15	75	68.0	78	66.6	65	51	36	29	40	36.5	29	10	31	19	42	28	30	16	51	31	81	55	78.5	72
16	77.5	59.3	74	64.5	70	45	50	29	40	36	29	2	31	18	40	27	25	15	66	43	79	62	73	66.5
17	85.4	64.3	75.1	64	63	53	50	35	43	36	18	2	30	17	29	23	15	4	59	42	63	67	68	62
18	84	74.1	82	61	62	53	56	28	50	40	20	9	35	17	43	22	21	0.5	60	45.5	63	68	84	60
19	84	72	78	67.9	70	52	68	34	52	46	18	10	37	31	43	22	19	7	70	36	79	65	72	63
20	91.3	70	73.8	57.4	78	53	71	49	46	42	20	7	40	11	38	22	38	2	48	35	85	65	77	58.5
21	74	60.1	70.2	48	78	58	75	54	45	41	30	16	20	4	58	32	34	28	53	38	76.5	61	75	59
22	80	52.4	74.2	48.1	68	57	69	54	45	32	29	20	30	19	57	37	48	28	58	36	61	50	62	54
23	68.2	60	79	60.3	66	55	64	43	35	28	23	17	23	10.5	52	36	47	28	70	44.5	54	46	71.5	44
24	72	54	85	65	65	59	51	34	34	28	20	12	20	14	39	33	31	23.5	64	46	52	41	84	58
25	72	53	79	67.2	72	61	41	34	36	30	24	13	22	8.5	35	28	33	29	50	38	57	46.5	82	64
26	71.6	50.1	73.2	62.8	65	51	42	32	36	30	24	18	40	20	35	27	31	30	52	36.5	64	46	79	64
27	83.4	58	70	51.2	56	46	44	32	33	28	21	9	37	29	32	22	36	28	58	37	63.5	42	70	64.5
28	77.2	57	73.2	45.6	65	42	54	40.5	33	27	21	5	41	23	36	22	33	26	69	42	70	47	72	61
29	75	60.9	76	55.6	59	48	55	43	34	26	24	18	46	35	.....	.....	33	24	59	44	78	54	79	59
30	78	63.2	80	62.5	53	40	63	48	33	20	22	10	47	27	.....	.....	40	27	44	36	76	62.5	87.5	67
31	75	57.9	86.2	65.8	.....	.....	75	54	.....	.....	20	14	50	37	.....	.....	49	38	.....	.....	83.5	56	.....	.....
Range	41°.2		40°.6		38°		49°		51°		50°		53°		42°		58°.5		49°		52°		43°.5	
Monthly means	72°.9		70°.5		60°.2		47°.8		40°.4		21°.0		23°.2		33°.5		29°.3		44°.8		57°.4		67°.9	

Maximum, minimum, and mean temperatures—Continued.

STATION, CORSICANA, TEX.

Day of month.	1876. July.		1876. August.		1876. September.		1876. October.		1876. November.		1876. December.		1877. January.		1877. February.		1877. March.		1877. April.		1877. May.		1877. June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	85	73	100	74	98	74	70	41	72	58	37	21.5	39	15	69	58	53	43	70	56	79	47	92	71
2	93	71	84	69	86	71	77	43	58	44	51	22	43	24	63	58	62	41	60	42	81	52	90	70
3	93	75	93	69	95	69	84	51	62	40	58	27	36	15	66	56	76	43	57	51	74	57	90	67
4	95.5	76	95	71	98	72	88	62	70	54	53	33	54	24	65	43	51	31	61	52	62	53	89	68
5	94	73	96	72	98	73	89	62	75	61	57	31	50	37	64	40	54	39	84	57	78	50	94	67
6	95	73	99	74	98	73	91	65	70	51	53	37	53	37	63	44	65	35	79	59	73	59	95	72
7	90	72	98	75	98	74	78	64	65	40	60	46	66	34	67	47	67	54	84	58	75	49	90	75
8	90	73	98	74.3	97.5	72	72	54	75	42	60	37	35	18	57	41	65	34	69	57	78	54	87	69
9	94	75	92	72	99	71	81	51.5	72	44	62	31.5	52	26	56	38	43	29	71	48	77	54	73	59
10	87	74	85	71.3	81	68	91.5	55	76	45	55	27	65	35	62	36	54	30	70	47	80	58	79	50
11	96	75	92	74	84	58	76	52	77	51	67	32	74	55	57	43	67	49	70	47	78	59	85	54
12	96	73	97	72	87	61	77	47	78	61	72	37	63	27	50	48	75	61	60	52	81	62	90	60
13	96	74	97.5	75	95	62	83	47	68	35	72	54	37	22	48	39	75	56	71	47	83	63	87	63
14	97	73	94	73	83	62	81	62	38	26.5	56	45	54	32	46	40	82	48	78	50	85	68	85	70
15	99	71	97	73	82.8	58.3	64	49	41	27	59	34	57	29	48	42	78	46	81	54	81	69	91	67
16	93.5	73	99	73	85	55.5	70	36	60	39	63	34	29	18	49	45	85	61	71	60	83	69	91	72
17	96.5	71	99	73	89	55	73	55	65	40	65	41	43	28	59	40	61	37	73	65	83	68	90	70
18	95.5	70	101	75	89	59	78	60	56	44	48	22	45	35	64	39	75	43	74	59	83	67	92	67
19	99.5	72.3	101	74	84	67	85	60	64	35	55	19	54	44	72	54	77	51	73	52	85	64	94	73
20	97.7	75	100	74	85	67	86	59	71	42	64	44	56	41	58	40	79	60	83	52	93	65	95	74
21	98.9	73	98	74	86	53.8	76	58	61	47	57	43	41	34	61	36	76	49	84	54	94	68	92	75
22	99	75	98.5	73	95	55	68	48	46	38	57	38	47	38	63	47	89	49	79	57	93	65	88	71
23	95.3	76	100	72	97	61	82	49	52	37.5	48	38	45	30	59	39	75	46	79	64	95	66	92	72
24	101.5	74	100	74	92	64	86	51	60	42	38	21	54	26	60	37	51	31	79	62	87	69	95	76
25	96	74	92	74	87	65	85	53	66	39	26	19	52	37	63	41	65	33	76	65	82	65	96	78
26	96	74	89	68	95	65	83	59	70	41	36	20	63	35	63	41	80	45	81	64	77	63	94	77
27	101	74	92	72	82	65.3	83	61	64	43	51	23	66	39	61	42	81	54	74	58	80	61	96	77
28	102.3	76	92	72	78	58.5	85	64	62	37	38	20	67	39	54	43	76	60	67	44	88	64	96	73
29	104	77	97	73	75	55	84	64	56	40	26	14	67	52	.....	.....	77	63	66	46	90	67	95	73
30	105	78	100	74	66	51.3	84	64	46	28	41	15	68	52	.....	.....	80	61	72	43	87	70	96	74
31	99	77	98	74	.....	.....	83	67	.....	.....	36	27	71	53	.....	.....	76	67	.....	.....	83	71	.....	.....
Range	35°		33°		47°.7		55°.5		51°.5		60°		59°		36°		60°		42°		48°		46°	
Monthly means	83°.6		82°.9		74°.8		66°.6		52°.4		41°.6		43°.0		51°.3		58°.1		63°.5		71°.3		76°.7	

Maximum, minimum, and mean temperatures—Continued.

STATION, DAVENPORT, IOWA.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	70	62	84	66	73	59	56	37	60	51	16	2	12	— 3	55	38	46	34	57	28	57	36	81	65
2	76	66	84	66	70	50	67	42	51	38	17	0	8	— 5	45	36	34	27	37	22	57	35	81	60
3	84	66	87	68	77	60	57	44	45	39	28	7	7	— 3	53	31	28	10	45	32	60	41	77	60
4	79	64	83	72	75	61	50	39	48	40	27	10	25	— 8	40	33	30	7	52	37	65	45	72	61
5	80	65	83	68	61	57	53	36	52	42	36	12	28	17	39	32	22	10	55	38	66	50	75	58
6	87	71	82	70	74	61	55	40	46	33	35	25	29	5	53	32	39	12	60	38	63	47	79	61
7	90	76	81	63	79	66	62	33	36	31	27	19	25	— 3	46	33	27	11	62	38	53	44	77	63
8	90	77	84	65	76	67	48	34	42	32	19	—11	5	—10	46	35	21	9	52	39	63	40	71	59
9	85	66	83	72	77	59	65	38	48	33	0	—17	20	— 2	44	30	15	0	46	39	64	47	59	46
10	80	65	80	73	65	60	62	35	55	37	27	0	24	18	50	31	31	7	58	42	66	45	72	44
11	83	69	79	72	63	58	49	28	63	42	46	8	29	10	47	28	42	27	59	41	64	46	64	51
12	86	70	86	71	67	57	57	38	65	47	47	28	12	1	32	18	37	23	63	41	61	52	71	52
13	87	75	88	75	64	55	62	43	47	31	42	33	19	— 5	40	22	37	22	59	40	70	51	67	59
14	87	70	82	69	61	54	50	33	36	29	33	8	22	4	41	24	36	16	60	38	68	55	83	57
15	79	67	80	67	68	49	45	25	37	28	38	5	20	12	42	32	32	12	67	42	71	59	85	68
16	84	68	83	66	69	52	56	33	36	31	7	— 7	12	— 3	39	28	30	19	72	50	77	58	78	63
17	90	75	85	74	71	53	65	41	42	34	12	4	27	— 2	41	26	28	9	70	57	78	65	80	62
18	86	73	86	73	76	59	67	40	40	26	13	— 7	31	23	59	32	31	21	68	55	83	69	79	62
19	90	72	82	67	77	61	59	53	38	25	15	8	25	5	41	31	32	22	55	47	80	68	77	64
20	85	72	75	65	70	65	60	52	40	32	21	4	21	2	48	25	28	24	63	40	77	65	86	57
21	83	66	82	60	77	62	58	50	38	24	27	9	28	1	55	33	39	21	66	44	75	57	76	65
22	85	69	89	71	74	61	55	49	35	17	24	8	21	1	50	38	57	32	73	49	66	53	76	62
23	72	60	90	75	75	62	59	49	31	21	10	2	23	—11	44	28	32	23	72	56	68	47	78	57
24	78	57	82	69	78	65	51	40	40	23	19	— 2	18	7	30	24	31	22	60	45	68	49	82	65
25	79	61	73	58	71	62	46	35	41	29	25	18	32	— 2	39	20	35	18	64	41	70	49	75	64
26	80	65	72	53	63	48	50	32	32	29	21	17	35	11	40	26	45	27	67	52	70	50	77	66
27	85	70	75	53	62	42	62	38	34	20	21	7	37	22	43	28	44	31	55	44	75	55	76	60
28	83	65	79	60	64	47	71	57	27	8	20	8	46	21	49	28	47	32	45	37	77	56	81	64
29	77	67	85	67	52	41	71	50	25	16	16	4	44	32	.....	.....	49	30	40	34	83	61	86	68
30	84	65	79	69	46	42	75	59	22	9	13	— 4	53	42	.....	.....	45	33	48	31	85	66	85	68
31	84	68	82	68	.....	.....	63	55	.....	.....	23	8	52	41	.....	.....	66	41	.....	.....	82	68	.....	.....
Range	33°		37°		38°		50°		57°		64°		64°		41°		66°		51°		50°		42°	
Monthly means	75°.9		74°.9		62°.5		49°.3		35°.3		15°.6		17°.2		36°.1		28°.7		49°.8		62°.2		69°.2	

Maximum, minimum, and mean temperatures—Continued.

STATION, DENISON, TEX.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	86	72	90	73	93	75	68	38	72	50	38	15	37	13	63	54	49	41	66	48	76	52	86	70
2	87	68	83	70	79	69	74	43	56	40	45	19	38	18	63	55	55	39	56	34	77	54	82	71
3	88	74	88	69	89	70	81	54	59	39	53	19	39	11	61	50	64	32	54	44	75	51	86	69
4	89	75	88	70	90	73	82	52	67	47	50	26	47	15	61	41	47	25	64	48	64	49	91	60
5	89	74	92	72	93	74	70	52	73	47	54	26	48	22	61	39	50	30	77	47	75	48	86	61
6	90	74	91	75	94	74	79	59	68	47	56	36	46	21	60	42	60	33	75	60	70	55	88	70
7	89	74	93	73	92	74	70	50	63	38	54	33	62	24	57	42	65	51	81	57	71	49	87	72
8	85	74	95	75	91	75	62	52	69	42	57	27	36	12	55	40	64	24	64	56	70	49	90	70
9	83	76	90	73	84	72	71	52	68	42	38	18	47	18	51	38	38	22	65	46	78	54	78	57
10	87	71	89	73	75	64	78	56	71	46	52	20	60	24	59	36	54	24	64	46	78	60	75	50
11	81	74	87	71	79	57	69	43	76	55	65	20	71	34	57	43	62	47	63	43	77	62	81	58
12	89	73	90	74	83	62	73	44	74	62	71	40	34	18	53	46	72	53	54	50	77	63	85	61
13	92	74	88	74	85	61	78	49	69	28	72	49	39	16	50	40	65	46	66	48	85	60	87	63
14	98	74	89	75	78	58	64	52	38	24	59	36	45	24	46	37	63	48	73	51	85	70	83	69
15	94	73	90	74	76	56	58	38	40	23	55	26	50	15	48	41	71	37	77	54	83	71	91	69
16	91	76	91	75	81	57	61	37	54	29	60	27	32	12	49	40	80	46	73	59	80	70	95	74
17	90	72	92	75	82	60	67	43	54	35	61	35	51	16	56	34	55	32	72	63	81	67	92	71
18	90	73	95	75	83	63	83	48	54	38	35	13	49	37	62	38	77	40	70	57	82	66	91	69
19	94	75	92	76	88	68	84	55	53	32	50	15	50	41	64	43	75	52	65	52	85	63	95	73
20	93	76	93	76	80	64	76	50	68	40	60	21	50	30	55	35	78	54	71	52	87	60	93	75
21	92	75	92	76	81	55	62	53	65	40	55	36	46	27	59	36	70	44	80	52	92	66	97	71
22	94	73	92	75	89	56	64	44	52	37	53	31	47	32	59	44	80	53	80	58	91	68	84	69
23	94	77	94	74	96	63	77	47	55	32	49	29	44	22	53	38	70	35	77	64	93	68	92	72
24	93	77	93	76	92	68	77	53	59	37.5	34	15	51	22	55	32	46	29	76	61	81	65	92	76
25	79	69	86	70	91	67	77	49	63	39	29	5	50	33	58	36	59	30	71	59	75	65	95	77
26	78	70	83	67	90	69	81	57	70	43	31	19	54	30	58	36	80	44	76	62	78	64	92	67
27	91	71	88	73	81	65	80	61	58	38	42	20	62	32	57	33	81	54	68	53	80	61	91	77
28	96.5	75	89	73	81	58	81	67	55	34	36	16	66	37	54	41	73	59	58	43	80	63	93	76
29	100	79	91	75	72	52	83	66	56	34	29	7	66	52	.....	.....	73	57	60	40	87	68	92	74
30	97	79	94	76	60	44	83	65	46	24	36	7	64	52	.....	.....	78	58	67	44	80	70	95	75
31	90	77	96	74	.....	.....	83	66	.....	.....	39	20	69	55	.....	.....	79	64	.....	.....	85	70	.....	.....
Range	32°		29°		54°		47°		53°		67°		60°		32°		59°		47°		45°		47°	
Monthly means	.....		.....		.....		.....		.....		.....		.....		.....		53°.9		60°.6		71°.2		77°.9	

Maximum, minimum, and mean temperatures—Continued.

STATION, DENVER, COLO.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	75	49	80	61	73	51	71	31	43	31	47	10	45	18	48	27	41	31	55	25	63	36	74	44
2	95	50	88	58	90	49	84	44	49	23	47	20	37	18	50	25	49	19	58	26	50	40	73	42
3	93	59	94	60	88	55	58	37	52	20	48	23	50	15	45	20	19	0	60	32	58	38	77	53
4	95	57	93	60	85	61	61	40	57	24	53	23	45	38	40	27	28	4	69	33	66	34	76	49
5	95	54	86	56	84	54	85	45	58	24	57	25	51	25	39	16	48	0	70	36	56	33	81	43
6	101	59	93	57	90	50	71	40	58	16	35	19	47	29	40	18	60	34	65	34	60	32	71	46
7	97	67	94	60	90	51	60	34	64	29	47	19	37	10	41	20	51	27	62	41	72	36	60	45
8	96	68	93	60	72	55	68	37	69	36	42	22	42	0	44	21	41	5	56	36	78	40	53	39
9	91	43	86	64	78	42	79	42	70	35	53	20	54	33	52	22	36	8	45	33	78	45	75	39
10	95	58	81	45	85	46	70	40	76	38	60	33	58	24	49	24	61	21	48	34	70	44	69	54
11	98	58	92	49	85	45	74	45	67	33	65	37	46	2	36	21	62	31	44	34	57	44	71	45
12	84	62	100	57	68	51	72	45	43	18	68	34	13	—15	38	20	60	29	52	32	60	45	83	51
13	75	54	90	54	66	47	63	47	26	11	54	26	33	— 5	46	18	66	41	66	32	64	44	80	49
14	83	53	71	59	72	42	58	45	56	9	48	20	39	13	54	24	68	31	67	35	76	41	85	50
15	90	56	89	53	85	38	67	34	66	33	48	19	38	—10	35	27	75	42	70	35	76	42	77	49
16	88	55	92	63	80	58	70	42	59	35	65	19	39	—15	42	17	58	35	65	40	68	48	92	50
17	90	62	95	60	67	50	62	48	55	33	48	12	29	3	52	22	66	30	47	34	73	40	94	56
18	92	57	82	60	57	50	65	41	53	18	55	15	24	— 8	55	26	71	31	50	36	63	46	74	54
19	89	64	79	63	75	45	55	42	68	34	50	16	50	15	53	27	70	32	62	32	67	45	92	52
20	85	57	77	59	81	41	52	36	45	32	45	17	25	5	60	25	60	35	72	38	74	39	90	50
21	93	60	85	53	85	49	52	24	40	20	44	27	20	— 5	52	37	73	31	70	48	74	43	92	55
22	94	58	78	53	76	52	62	38	34	14	35	9	16	— 8	53	24	60	45	49	33	70	53	95	54
23	90	63	87	50	81	45	67	41	57	7	9	—12	40	—15	58	28	45	26	49	27	76	51	88	54
24	83	63	74	49	77	50	66	28	55	32	2	—25	37	— 8	60	29	57	15	45	28	71	51	82	48
25	88	58	84	44	80	43	70	26	60	33	10	—15	42	11	39	28	70	37	39	33	70	50	80	50
26	88	60	80	56	81	47	75	33	56	29	23	— 5	46	9	39	29	75	40	35	30	82	49	77	47
27	97	56	78	55	81	45	68	45	35	25	21	4	38	11	45	28	69	40	45	27	85	48	80	45
28	98	60	84	53	71	53	77	39	32	7	18	— 3	48	12	50	28	61	41	42	26	84	50	85	54
29	90	60	84	54	62	40	69	39	28	11	20	—15	50	19	.....	.....	65	37	45	12	83	52	88	58
30	93	63	85	55	52	32	53	29	27	3	36	16	51	25	.....	.....	63	41	66	26	60	54	86	46
31	91	64	75	57	.....	.....	57	27	.....	.....	36	10	47	24	.....	.....	52	32	.....	.....	61	44	.....	.....
Range	58°		56°		58°		61°		73°		93°		73°		44°		75°		60°		53°		56°	
Monthly means	76°.4		70°.1		61°.5		51°.7		37°.1		27°.2		24°.1		34°.5		42°.8		44°.2		58°.5		65°.1	

Maximum, minimum, and mean temperatures—Continued..

STATION, DETROIT, MICH.

Day of month.	1876. July.		August.		September.		October.		November.		December.		1877. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	75	63	84	61	72	60	52	38	68	57	21	12	20	12	47	37	41	25	65	35	40	33	83	63
2	82	67	82	60	68	50	60	44	61	43	31	20	20	9	48	35	48	33	36	24	51	32	84	66
3	82	65	75	66	72	47	53	45	45	37	28	23	16	7	38	34	37	28	35	20	56	37	77	65
4	76	67	83	65	70	53	50	39	47	40	33	22	13	7	34	26	28	12	50	30	56	36	75	57
5	80	66	77	69	63	46	52	37	52	42	32	14	22	8	35	23	26	14	47	35	55	41	64	57
6	82	63	80	68	65	56	53	44	51	37	34	24	32	18	35	31	35	12	57	33	62	40	72	51
7	88	68	82	69	75	60	48	37	43	35	28	22	31	20	43	32	35	18	47	29	56	41	74	52
8	90	72	82	62	74	62	45	36	39	34	22	8	20	10	35	27	29	19	48	33	58	39	79	60
9	90	73	82	64	67	55	53	29	44	32	8	— 5	10	5	37	23	20	8	50	35	55	38	69	54
10	83	68	85	67	64	57	50	36	43	28	10	— 9	22	10	46	24	22	4	57	35	55	38	60	46
11	81	64	82	72	61	55	45	28	49	34	28	— 1	29	14	51	32	37	17	58	36	60	42	68	50
12	88	71	85	71	67	50	48	32	56	38	37	27	14	2	44	21	32	23	52	34	62	40	70	52
13	89	74	87	72	65	44	55	34	54	45	42	34	14	0	27	16	31	15	59	31	66	43	78	56
14	91	68	84	72	67	54	46	29	45	32	38	16	22	13	37	18	32	18	53	31	70	44	73	58
15	90	62	77	62	67	50	39	24	38	32	30	10	22	14	42	25	28	9	57	35	65	52	79	63
16	81	61	74	57	67	48	52	29	37	32	30	— 3	23	12	37	27	25	10	67	43	77	59	77	61
17	86	65	80	67	69	52	51	37	41	35	10	— 2	26	10	30	18	16	— 2	53	42	80	61	74	54
18	89	74	82	67	71	53	57	34	47	39	18	7	32	14	43	19	25	8	48	45	86	64	85	59
19	87	73	80	67	76	50	65	39	47	44	14	7	36	30	40	21	22	14	52	44	86	66	71	53
20	87	(*)	69	56	77	51	67	52	46	43	24	2	36	7	42	17	28	6	56	39	82	62	77	48
21	73	60	73	46	69	61	72	54	46	41	26	15	17	— 2	58	33	40	23	63	41	77	61	80	57
22	78	57	74	56	66	61	64	54	44	29	24	17	25	13	53	36	45	29	67	43	61	51	62	49
23	70	54	85	66	64	60	57	46	33	28	21	10	17	5	41	32	43	25	75	49	61	42	70	42
24	74	54	85	69	68	59	48	38	32	27	15	2	18	12	43	29	25	19	65	42	53	37	81	55
25	73	53	80	62	73	55	41	37	36	30	20	10	21	4	43	29	30	24	55	35	59	45	82	63
26	74	53	74	52	59	45	41	35	37	30	24	14	36	13	40	24	37	26	60	39	65	45	79	63
27	81	64	75	47	57	41	45	29	34	30	20	12	37	(*)	40	23	45	26	55	41	70	45	73	62
28	83	66	78	52	56	43	53	41	33	27	19	4	40	19	37	23	40	24	50	44	75	50	80	62
29	76	63	78	62	55	43	47	42	34	19	23	17	44	24	.....	.....	40	21	52	40	78	52	79	62
30	78	61	79	64	50	39	62	46	26	16	23	6	40	26	.....	.....	45	26	42	35	80	60	84	67
31	82	60	87	69	.....	.....	72	57	.....	.....	19	14	48	30	.....	.....	50	36	.....	.....	82	58	.....	.....
Range			41°		38°		48°		52°		51°		.....		42°		52°		55°		54°		43°	
Monthly means	73°.0		72°.1		59°.1		46°.2		36°.6		18°.5		20°.3		33°.2		26°.7		46°.0		57°.7		67°.2	

*Observation evidently erroneous, therefore omitted.

Maximum, minimum, and mean temperatures—Continued.

STATION, DODGE CITY, KANS.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	74	58	90	72	77	60	67	24	50	34	35	12	31	9	57	35	42	33	50	32	78	41	79	46
2	92	53	86	70	80	50	81	40	54	28	46	16	20	12	53	28	48	27	54	25	68	51	78	59
3	95	68	88	67	93	64	66	41	50	33	36	19	32	10	57	30	43	14	66	34	54	42	67	59
4	96	68	92	66	94	67	62	41	56	34	45	12	41	10	50	31	29	18	73	38	65	42	75	57
5	93	67	96	68	99	70	85	36	61	37	59	22	39	34	46	28	48	7	79	44	61	44	81	52
6	93	71	88	68	97	65	69	42	55	30	44	26	42	30	46	34	60	30	78	40	61	39	86	61
7	89	71	93	63	94	69	59	41	61	30	48	20	38	4	46	38	38	23	58	50	70	34	71	52
8	89	70	95	70	90	65	56	39	68	36	46	16	27	0	41	27	28	13	53	42	73	44	69	48
9	90	66	91	67	70	56	76	44	69	35	43	4	44	21	48	23	32	9	52	36	74	52	65	42
10	86	65	76	53	73	46	61	43	74	33	58	24	38	28	59	26	54	23	56	34	82	54	75	49
11	92	64	86	53	84	52	60	35	65	36	63	28	35	5	48	25	55	36	47	37	68	52	70	51
12	93	69	92	68	84	56	81	45	49	27	69	34	7	— 4	28	19	51	32	57	43	59	52	83	54
13	98	70	95	71	71	50	76	58	27	16	48	32	28	7	34	19	72	33	63	36	63	51	79	57
14	90	66	84	64	71	48	61	34	34	5	42	22	38	22	32	15	56	24	73	45	78	54	65	61
15	94	61	85	69	78	47	51	25	54	20	54	21	35	2	36	28	80	34	78	42	82	58	77	62
16	96	68	94	69	88	57	68	38	52	24	36	8	23	— 2	46	27	58	28	79	54	80	62	91	62
17	96	71	96	72	90	56	56	42	56	29	32	12	32	12	58	28	70	20	73	45	84	62	92	65
18	91	71	101	71	72	62	58	49	53	26	44	6	16	10	63	32	82	39	53	42	64	54	96	68
19	97	68	98	68	70	59	51	43	52	24	46	16	40	14	50	33	74	38	64	45	74	51	92	68
20	89	69	83	65	70	50	64	36	52	33	42	21	34	13	56	23	63	41	71	39	78	42	97	64
21	89	66	88	68	78	46	43	38	49	32	49	17	34	10	58	34	76	35	79	47	86	57	84	65
22	94	68	91	66	88	54	64	32	48	31	44	17	28	6	52	34	84	34	78	49	88	60	85	62
23	100	71	93	64	81	54	75	37	51	23	27	4	27	— 2	53	31	34	20	57	37	86	63	90	64
24	82	61	82	65	91	59	63	38	54	34	7	— 3	34	4	52	27	52	16	47	39	78	59	84	65
25	76	59	76	52	76	53	73	38	62	30	10	—10	37	14	44	23	75	35	53	43	73	60	85	70
26	87	66	82	52	75	52	80	45	66	32	9	—15	45	11	46	30	80	38	60	45	77	60	84	63
27	92	71	88	65	77	49	79	54	44	35	10	— 9	45	12	45	29	71	38	48	38	79	60	85	66
28	99	71	93	67	71	53	79	41	39	30	18	— 5	55	20	50	34	60	38	51	33	79	65	85	71
29	108	72	94	67	58	39	82	42	35	22	11	—14	49	33	.....	.....	71	45	52	32	85	65	98	71
30	101	72	97	69	56	30	70	40	30	14	24	1	56	36	.....	.....	76	54	65	28	84	67	85	59
31	99	72	97	69	.....	.....	64	35	.....	.....	26	10	59	27	.....	.....	68	43	.....	.....	79	52	.....	.....
Range	55°		49°		69°		61°		69°		84°		63°		48°		77°		54°		54°		56°	
Monthly means	79°.6		77°.2		66°.7		52°.6		38°.4		22°.8		23°.9		37°.1		42°.6		50°.1		62°.7		70°.6	

Maximum, minimum, and mean temperatures—Continued.

STATION, DUBUQUE, IOWA.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	71	59	86	62	73	59	58	35	57	44	17	3	10	— 3	51	35	45	33	55	27	58	31	80	62
2	77	62	87	62	72	49	70	40	44	38	18	3	7	— 3	42	32	36	27	42	21	58	35	78	58
3	82	64	89	63	80	57	60	43	45	35	26	6	12	— 2	38	25	27	10	45	30	65	36	75	58
4	80	62	87	69	75	61	48	37	50	38	24	8	23	— 6	36	32	28	6	47	36	66	44	76	58
5	84	61	86	67	63	52	51	33	50	37	37	12	27	22	40	33	22	10	57	30	68	48	78	56
6	89	67	89	68	70	56	51	39	45	31	33	25	30	22	48	32	40	10	63	35	63	45	81	54
7	92	76	85	58	72	63	58	30	37	32	26	15	27	— 1	43	29	25	14	63	37	58	46	78	63
8	94	75	87	62	67	62	50	31	44	32	15	— 9	3	—12	42	29	21	12	52	41	68	43	68	59
9	87	69	85	68	63	56	69	35	50	28	2	—18	20	— 8	37	24	14	1	55	39	67	44	59	45
10	84	62	92	71	63	57	68	32	56	34	20	2	21	17	51	32	28	0	61	40	72	44	70	40
11	84	65	82	64	60	56	50	28	60	40	41	6	22	9	45	25	41	24	62	39	71	46	63	50
12	91	64	89	67	67	52	57	35	63	46	45	26	12	— 1	32	16	33	24	61	40	68	46	70	50
13	90	69	93	73	61	55	53	36	50	30	42	32	18	—11	40	20	39	13	61	39	74	55	71	55
14	86	68	84	68	63	53	48	32	36	25	34	7	21	2	40	20	35	13	65	34	67	52	86	55
15	86	67	82	66	72	45	46	23	39	24	39	2	17	7	40	34	32	5	66	40	74	62	86	67
16	87	65	85	64	73	51	59	32	37	29	2	—10	12	— 2	38	23	31	18	72	42	80	60	80	62
17	95	74	87	67	73	51	64	37	40	31	11	— 3	24	— 4	40	23	28	2	73	55	85	64	85	58
18	85	69	85	70	79	59	67	37	38	28	15	— 3	30	14	58	32	30	18	62	51	85	69	84	67
19	92	70	82	63	79	61	60	51	40	30	15	3	27	12	43	32	33	20	55	46	82	69	72	61
20	84	69	79	62	72	63	64	51	39	31	27	9	16	— 2	50	22	32	21	65	42	76	61	85	56
21	86	62	79	58	78	61	56	48	40	22	33	5	28	4	57	35	40	22	69	41	69	54	79	63
22	82	69	91	70	77	58	54	48	34	15	22	9	18	0	47	36	52	30	76	49	62	54	78	58
23	75	58	95	74	71	61	60	38	27	19	10	— 1	22	—19	39	28	35	25	70	54	70	48	68	57
24	82	55	90	68	79	59	51	40	37	17	20	— 9	21	6	31	25	31	21	61	41	72	44	84	64
25	82	56	75	55	71	58	46	33	38	25	26	17	28	— 7	40	23	37	14	64	40	75	49	78	64
26	83	60	75	50	62	45	49	29	33	27	22	10	35	8	40	25	43	27	65	51	76	50	80	61
27	84	71	77	46	63	40	66	36	33	17	18	—10	40	19	44	27	47	29	55	42	79	50	78	57
28	84	61	76	56	63	47	66	52	27	7	19	— 2	45	15	48	25	46	30	43	35	80	53	86	60
29	82	66	87	63	52	40	63	45	27	14	17	— 3	46	22	.....	.....	47	29	41	31	86	58	90	65
30	87	62	82	65	47	39	70	56	22	11	16	— 2	46	38	.....	.....	46	37	49	30	87	65	82	68
31	90	63	85	65	.....	.....	62	51	.....	.....	24	— 3	48	38	.....	.....	65	41	.....	.....	85	64	.....	.....
Range	40°		49°		41°		47°		56°		64°		67°		42°		65°		55°		56°		50°	
Monthly means	75°.5		74°.2		61°.6		48°.1		34°.5		13°.8		15°.9		35°.1		27°.5		48°.5		62°.6		67°.7	

Maximum, minimum, and mean temperatures—Continued.

STATION, DULUTH, MINN.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	65	47	72	57	67	53	58	34	46	36	16	— 4	16	— 3	39	32	44	36	44	16	54	27	69	48
2	57	47	81	62	78	48	67	42	44	35	21	— 2	10	— 7	40	34	37	14	33	5	57	32	60	50
3	80	50	76	62	71	56	46	36	41	34	22	4	11	—13	36	27	20	4	37	19	61	36	62	50
4	79	52	72	65	66	49	40	32	40	32	29	3	16	5	37	23	18	4	40	31	51	40	62	52
5	81	55	65	58	60	50	42	30	43	34	39	13	27	6	45	34	22	6	47	25	49	38	66	43
6	68	53	77	58	57	52	42	34	43	30	36	18	34	9	44	32	27	8	40	12	49	38	61	45
7	62	50	83	59	66	54	43	34	34	27	18	— 3	9	— 4	41	23	10	— 6	51	31	52	38	57	47
8	90	53	89	61	61	49	43	26	44	31	4	—23	2.5	—25	41	22	22	— 4	51	39	55	36	67	47
9	81	55	80	69	57	52	57	34	55	29	— 3	—30	6	—27	46	25	22	— 3	49	38	52	36	51	38
10	75	54	80	61	56	50	40	30	46	33	13	—15	15	— 6	43	27	32	4	48	36	52	36	55	39
11	73	53	76	56	60	51	48	24	50	35	36	— 1	7	—19	37	12	35	8	44	37	51	38	48	42
12	74	58	70	57	59	48	57	35	46	36	37	23	1	—24	27	2	33	16	45	34	55	38	60	40
13	81	63	69	58	54	44	43	33	36	17	32	24	23	—10	35	15	34	18	46	33	60	42	65	45
14	82	62	71	60	68	42	37	23	32	19	32	— 8	6	—20	38	22	29	7	46	34	56	44	56	44
15	81	62	66	53	67	46	47	23	34	22	26	—20	6	—14	40	26	30	7	47	36	58	44	68	45
16	78	58	73	56	73	49	61	32	38	26	— 4	—28	4	—18	26	15	22	6	51	36	78	42	68	47
17	88	61	67	58	62	57	49	40	40	34	7	—12	18	— 7	32	7	24	— 3	43	36	60	47	61	51
18	73	57	81	56	63	55	48	37	38	31	16	—10	16	— 3	45	26	25	0	47	38	68	54	76	53
19	90	52	74	58	70	56	47	42	37	33	6	—16	17	— 1	38	29	34	7	54	37	55	47	56	43
20	77	61	68	52	67	57	50	44	41	33	15	— 1	8	—11	54	25	37	21	52	33	52	43	53	41
21	65	51	66	54	65	52	53	44	36	25	16	2	16	— 8	57	32	35	24	52	34	48	42	70	47
22	71	50	64	59	59	54	51	45	25	14	11	—10	10	—11	46	31	25	9	52	39	54	43	63	47
23	72	53	82	58	75	51	46	41	26	13	13	— 2	19	— 7	32	22	30	— 1	39	42	65	39	74	47
24	79	57	79	59	60	51	42	36	32	17	16	—11	17	— 5	29	17	34	2	58	34	66	42	77	48
25	81	55	67	51	62	45	41	35	32	21	23	6	28	1	32	22	33	6	63	32	60	43	68	54
26	70	55	73	45	58	42	41	27	30	21	22	7	47	14	35	28	38	22	32	37	63	43	59	49
27	82	53	77	52	60	43	43	34	30	22	22	12	35	22	42	17	46	32	42	33	64	44	74	47
28	78	63	76	60	54	43	44	38	22	8	17	8	51	29	48	19	42	30	40	34	64	46	77	55
29	76	61	66	59	43	36	46	41	21	6	22	3	46	24	.....	.....	40	24	47	29	63	49	69	54
30	70	58	77	57	46	34	50	43	13	— 7	15	— 6	39	32	.....	.....	38	30	47	28	68	51	66	48
31	68	57	73	60	.....	.....	51	37	.....	.....	13	— 3	42	35	.....	.....	46	35	.....	.....	68	52	.....	.....
Range	43°		44°		41°		44°		62°		69°		78°		55°		59°		58°		51°		38°	
Monthly means	64°.9		65°.5		55°.5		41°.7		31°.3		10°.0		11°.8		32°.2		22°.6		40°.3		50°.7		56°.6	

Maximum, minimum, and mean temperatures—Continued.

STATION, EASTPORT, ME.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	72	50	75	54	59	50	55	45	49	40	23	12	21	8	36	33	30	23	40	30	52	38	74	48
2	58	50	75	54	66	52	58	42	48	45	37	16	16	10	33	24	38	20	37	30	50	41	64	47
3	63	54	72	54	68	51	57	41	60	46	34	28	11	− 1	36	26	44	35	42	33	44	36	67	46
4	82	53	75	53	68	53	60	51	49	36	35	27	2	− 5	37	29	38	32	40	30	55	35	75	47
5	75	57	71	52	62	46	56	44	42	30	35	23	13	1	38	26	34	16	42	24	58	40	71	53
6	74	51	81	53	63	46	58	41	41	33	37	22	27	4	36	26	27	17	42	35	55	38	64	48
7	72	51	82	58	64	47	57	41	53	36	39	31	40	27	34	23	36	16	44	33	48	40	60	48
8	81	52	83	55	56	49	51	38	57	47	33	27	40	27	33	24	40	14	42	34	47	36	57	49
9	69	55	61	60	60	49	46	35	48	43	33	21	41	− 2	26	16	46	38	46	34	43	36	59	47
10	66	54	79	59	63	45	54	37	48	42	22	− 6	27	− 4	29	13	38	20	43	36	44	38	56	48
11	79	54	77	58	69	45	50	36	47	42	17	− 8	27	15	30	24	30	17	45	31	50	35	68	50
12	71	49	66	52	62	50	47	32	47	41	29	13	26	− 8	37	26	37	21	39	28	56	36	63	48
13	80	51	69	53	66	45	54	40	46	40	39	12	17	0	36	14	33	18	46	29	65	38	64	47
14	73	56	68	53	69	47	50	36	42	37	40	34	20	− 5	26	8	30	8	45	31	75	40	73	49
15	75	56	72	56	58	51	50	29	38	31	39	14	19	− 6	34	14	34	23	55	32	69	48	72	55
16	82	56	70	53	57	47	42	29	36	28	36	− 9	19	3	37	27	26	16	52	35	63	41	62	49
17	76	58	66	53	59	44	45	36	34	30	− 3	−17	15	1	35	25	23	13	53	35	47	41	71	49
18	68	56	67	50	52	47	47	35	38	31	42	−12	24	5	26	13	15	8	55	36	52	42	78	52
19	83	52	65	48	54	48	49	33	35	30	43	6	29	11	20	11	24	7	49	32	65	41	71	48
20	69	51	62	47	51	46	55	39	41	33	11	− 4	41	25	28	10	32	12	45	34	61	42	69	49
21	78	56	61	46	53	47	51	37	41	34	14	− 4	33	11	32	15	42	21	47	38	65	38	64	49
22	70	55	60	48	59	45	53	46	40	35	24	10	34	17	38	24	43	36	51	38	62	46	68	49
23	56	52	64	47	63	45	56	49	44	39	24	12	26	14	38	21	37	28	63	40	52	43	65	45
24	61	50	72	48	57	48	59	52	41	35	19	9	29	13	36	29	41	24	62	41	50	41	63	49
25	63	47	64	51	58	50	55	41	36	29	18	8	16	− 9	33	29	32	23	55	40	48	39.5	72	47
26	59	48	75	54	53	49	51	38	34	28	22	7	17	− 9	36	27	37	28	55	39	48	41	70	52
27	72	48	66	52	58	49	46	37	36	26	27	13	32	12	28	16	44	33	63	43	56	42	70	51
28	67	51	64	46	57	46	38	30	38	25	28	15	14	5	33	15	45	38	58	37	68	42	68	48
29	64	51	65	51	59	47	45	28	30	22	26	11	29	10	.....	.....	45	35	43	37	80	43	69	47
30	72	56	67	50	63	51	43	31	23	16	36	17	33	22	.....	.....	37	27	43	38	60	44	65	47
31	63	53.5	72	49	.....	.....	50	34	.....	.....	20	9	38	22	.....	.....	42	30	.....	.....	67	43	.....	.....
Range	36°		37°		25°		32°		44°		60°		50°		30°		39°		35°		45°		33°	
Monthly means	61°.7		61°.3		53°.8		45°.1		38°.3		21°.6		16°.5		27°.9		29°.8		41°.1		47°.7		57°.7	

Maximum, minimum, and mean temperatures—Continued.

STATION, ERIE, PA.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	83	65	80	65	76	64	55	43	69	62	21	10	25	10	51	39	42	25	68	44	41	36	87	63
2	84	71	81	67	69	58	58	45	70	50	29	20	22	13	45	36	55	35	52	25	45	34	79	66
3	83	69	80	68	72	53	58	46	51	43	32	24	19	9	39	33	45	34	37	21	44	32	74	64
4	79	66	81	70	71	58	52	42	48	41	32	22	21	6	37	29	40	23	52	29	54	39	71	59
5	85	65	84	73	65	52	54	43	50	39	33	24	29	13	30	20	28	19	44	34	51	37	62	56
6	81	64	84	73	71	48	59	46	49	41	36	23	42	26	37	29	36	15	48	34	55	41	58	54
7	87	69	80	72	77	59	49	40	44	40	35	24	35	28	38	31	36	19	43	30	51	40	74	51
8	88	75	81	69	71	64	47	41	46	39	31	14	32	10	32	20	53	25	41	31	52	40	75	59
9	90	76	80	62	67	57	52	38	46	39	15	2	17	7	32	19	53	12	45	33	54	39	80	60
10	90	77	85	69	64	57	52	42	43	36	15	— 4	27	13	45	23	27	7	47	31	56	39	62	48
11	85	74	87	71	63	58	43	37	45	36	31	10	36	22	52	36	40	20	54	35	55	45	68	51
12	86	72	83	70	65	55	50	33	54	33	38	30	23	2	48	16	39	28	50	34	59	42	73	56
13	86	73	82	71	66	50	55	37	61	48	45	35	17	4	22	12	37	25	45	29	64	47	84	57
14	82	72	84	70	74	58	50	31	51	37	40	24	25	15	33	13	40	20	53	34	70	49	82	60
15	80	68	81	71	65	55	38	28	40	35	28	16	32	18	41	28	29	13	56	34	75	53	84	67
16	81	64	75	65	68	49	49	36	45	37	32	— 1	29	17	40	25	32	17	61	39	77	62	74	65
17	85	68	77	64	61	56	51	38	47	35	21	4	30	17	26	19	21	2	54	36	80	65	75	59
18	84	75	79	65	60	55	50	33	53	42	28	14	39	20	39	19	25	5	54	41	81	67	86	59
19	85	70	79	69	69	57	58	40	52	45	19	10	38	31	39	14	26	9	55	36	80	62	76	62
20	87	72	71	57	68	56	73	49	48	42	22	14	42	14	34	13	36	9	49	35	82	65	76	55
21	75	63	73	52	69	59	75	58	48	43	31	19	23	6	49	31	39	30	53	38	80	65	76	57
22	77	60	73	54	69	60	69	59	45	34	35	24	30	20	55	40	51	31	63	40	67	52	66	52
23	73	59	73	63	66	60	67	49	38	32	25	20	22	11	53	39	47	33	71	43	53	42	70	47
24	73	60	83	65	66	61	53	44	36	32	22	10	20	10	45	33	35	26	67	45	53	38	82	59
25	72	57	84	66	69	61	46	36	39	32	30	10	23	9	36	29	47	30	51	39	61	46	83	64
26	74	53	72	56	65	51	43	38	39	32	29	21	38	19	35	29	39	33	53	35	64	46	82	64
27	87	57	71	58	58	47	45	38	38	30	26	14	38	31	36	28	35	31	54	38	69	50	75	62
28	79	68	75	52	60	46	49	40	36	31	26	8	40	27	37	25	32	25	61	40	74	50	76	61
29	76	62	74	61	61	47	47	40	37	31	26	16	40	33	.....	.....	36	21	59	44	77	56	79	59
30	76	66	77	66	51	45	64	49	32	17	23	16	37	25	.....	.....	43	26	45	37	77	59	88	66
31	79	63	84	66	.....	.....	69	56	.....	.....	24	14	49	23	.....	.....	49	37	.....	.....	80	60	.....	.....
Range	37°		35°		32°		47°		53°		49°		47°		43°		53°		50°		50°		41°	
Monthly means	74°. 2		72°. 6		60°. 6		47°. 8		41°. 8		22°. 4		23°. 9		32°. 6		30°. 0		44°. 2		56°. 4		66°. 9	

Maximum, minimum, and mean temperatures—Continued.

STATION, ESCANABA, MICH.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	74	54	81	59	70	51	48	36	52	42	20	13	19	12	40	32	38	21	48	19	44	24	66	55
2	63	57	82	62	69	45	60	38	43	37	30	18	18	5	37	32	40	19	32	12	49	28	77	53
3	82	57	82	61	74	53	49	36	43	36	30	20	13	0	38	28	27	13	36	20	49	32	68	46
4	72	59	81	66	64	44	40	28	40	32	28	14	14	— 3.5	37	28	24	5	40	27	50	31	66	51
5	76	58	77	69	64	40	45	26	45	33	30	16	21	13	40	30	17	1	40	20	59	34	67	49
6	75	60	83	67	57	53	45	32	46	38	34	24	25	9	48	26	34	— 5	35	19	60	37	71	46
7	84	66	80	57	64	55	43	30	39	32	26	11	23	2	36	28	15	— 2	45	25	60	40	68	55
8	83	70	78	58	64	48	37	25	37	29	11	— 3	3	— 9	38	27	14	— 4	49	26	58	38	66	56
9	84	69	81	63	59	53	54	31	41	25	0	—10	5	—20.5	34	26	17	1	52	30	56	37	57	45
10	76	61	78	69	60	54	40	30	45	30	11	— 8	14	— 4.5	37.5	27	23	1	56	30	57	34	52	39
11	76	56	79	64	63	48	43	25	48	41	18	— 1	10	— 7	47	27	30	4	51	29	62	35	52	41
12	76	56	76	62	64	46	48	30	49	42	35	17	5	— 8.5	27.5	12	30	8	49	27	57	36	58	42
13	81	64	82	68	61	40	40	32	47	26	36	28	18	— 6	33	8	31	1	49	25	61	35	64	48
14	79	56	76	62	63	48	36	26	33	26	32	4	16	— 7	34	14	29	5	49	24	67	40	67	50
15	81	55	72	55	65	46	42	26	34	20	20	— 8	13	3	34	22	31	6	49	28	61	46	62	51
16	81	61	69	60	66	45	49	(*)	35	30	— 4	—13	14	— 1	32	15	15	— 2	48	34	72	47	67	46
17	91	68	73	61	66	52	45	.....	38	31	9	—11.5	14	— 2	29	13	20	— 9	54	30	66	53	70	55
18	84	66	74	60	70	45	51	.....	45	38	12	— 2.5	20	12	33	24	22	1	51	35	73	56	85	56
19	83	65	73	56	72	55	54	.....	41	36	16	— 1	20	7	30	11	29	10	55	31	67	51	66	43
20	78	59	66	46	68	58	53	.....	44	37	25	7	19	4	52	10	31	16	54	33	76	52	62	45
21	70	47	70	45	71	59	55	.....	45	41	23	12	17	— 3	45	26	40	12	53	29	64	52	66	50
22	65	50	67	59	64	56	53	.....	42	25	19.5	11	16	1	36	21	26	7	54	34	56	42	63	43
23	72	47	79	66	68	56	50	.....	30	23	16	9	14	— 7	22	15	28	— 4	61	34	59	41	67	42
24	71	50	79	65	65	46	43	36	30	20	21	12.5	17	1	26	14	29	— 8	55	35	56	40	62	57
25	74	51	74	56	65	47	41	33	33	27	25	16	16	6	32	15	32	— 4	48	25	63	41	73	56
26	72	54	70	46	55	41	37	31	30	25	25	15.5	28	11	33	16	38	3	44	31	63	37	72	54
27	74	62	72	45	57	39	40	27	30	24	20	3	32	15	32	18	43	19	45	31	66	44	71	51
28	77	59	73	56	56	41	43	38	30	21	24	— 4	37	23	35	8	34	18	34	29	67	52	70	54
29	77	62	69	61	44	36	46	42	29	18	23	16	37	16	.....	.....	44	15	32	28	66	54	72	56
30	80	58	73	63	48	36	50	45	22	15	19	12.5	37	17	.....	.....	42	21	35	27	67	55	80	59
31	80	58	69	59	.....	.....	54	45	.....	.....	18	7.5	38	35	.....	.....	42	33	.....	.....	67	56	.....	.....
Range	44°		44°		38°		.....		37°		49°		58°.5		44°		53°		49°		52°		46°	
Monthly means	68°.1		67°.9		55°.2		39°.7		33°.4		14°.6		11°.6		26°.7		18°.3		36°.9		51°.7		58°.5	

* Minimum thermometer broken.

Maximum, minimum, and mean temperatures—Continued.
STATION, FATHER POINT, CANADA.

Day of month.	1876. July.		August.		September.		October.		November.		December.		1877. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	(*)	.....	.....	.....	59.2	46.4	49.5	42.5	42.2	37.3	27.5	14.1	17.3	.....	25.1	19.5	28.1	6	37.9	20.1	58.4	32.4	51.3	41.4
2	.....	.....	.....	.....	50.6	47.6	45.9	36	39.7	34.2	34	24.2	16.6	.....	23.6	15.5	34.4	4.1	36.2	27.1	41.3	31.6	74.5	41.5
3	.....	.....	.....	.....	54.3	47.7	58.7	33	48.8	38	32	25.4	5.9	.....	30.2	15.1	39.7	21.7	32.4	11.2	40.7	33	67.1	51.6
4	.....	.....	.....	.....	53.2	44.7	52.4	41.1	38.9	31.8	32.2	20.9	7.4	.....	33	23.6	35.6	16.7	27	10.1	40.1	33.2	64.9	41.9
5	.....	.....	.....	.....	47.5	43.7	47.4	38.6	33.6	25	29.4	22.4	9.5	.....	33	17.7	23	9.3	31.9	14.5	39.9	32.8	60.9	40.4
6	.....	.....	.....	.....	51.8	44.1	42.4	32.3	37.1	25.6	32.5	21.2	17.3	.....	25.9	16.7	13.7	4	34	28.4	46.6	32	68.3	48.4
7	.....	.....	.....	.....	61.9	42	41.1	38.2	38.2	32.2	33.4	23	25.9	.....	31.5	21.2	21.2	— 0.6	34.1	29.3	40.7	33.3	64.1	47.7
8	.....	.....	66.6	48.7	49.4	36.2	39.7	34.8	36	32	24.6	1.8	27.3	.....	23.9	15	17.3	6.8	36.3	29.9	38.9	33.2	75.6	47.4
9	.....	.....	74.5	56.1	52.7	35.5	39.8	30.9	36.3	33.1	20.9	0.4	13	.....	17.1	10.1	52.3	14.5	39	30.1	37.9	33	80.1	45.5
10	.....	.....	76.1	52.3	54	38.6	43.9	30	37.9	33	18.9	4.2	10.3	.....	21.9	12.4	24.4	9	39.7	26.9	41.6	29.2	78.5	47.8
11	.....	.....	76	53.1	52.4	41.7	39.9	35.5	35.7	33.2	9.3	— 3.9	24.1	.....	22.5	11.1	25	5.9	36.2	24.4	48.1	27.7	59.8	46.3
12	.....	.....	77.8	54.1	52.8	42.9	41.2	31.9	35.6	33.4	16.3	— 2.1	6.5	.....	29.5	16.9	21.9	9.8	47.4	26.8	56.8	31.3	61	41.4
13	.....	.....	79.8	55.5	56.8	44.3	40.9	31.2	36	33.9	21.2	10.8	6.4	.....	20.8	9	15.3	— 0.2	41.2	24.9	63.7	35	60.9	44.3
14	.....	.....	76.8	57	60.2	44.4	33.5	24.1	37.4	28.5	28.8	16.3	10.3	—15.4	20.3	6	27.5	— 2.6	46.6	25.4	55.2	41.2	61.3	48.2
15	.....	.....	78.9	49.3	55.7	45.3	35.4	31.2	29.9	20.1	32.3	4.4	— 5.2	—18.8	29.2	17.7	31	16.2	47.8	24.7	66	39.4	66.5	48.7
16	.....	.....	59.9	45.2	50.2	40.4	35.9	31	29.1	20.6	14.9	— 8.4	1.6	—14.4	27	17.7	18.1	— 4.6	43.2	24.7	51.1	40.6	64.9	46.9
17	.....	.....	63.4	47.4	51.7	36.1	39.4	34.2	26.2	21.3	— 4.4	—10	10	—12.1	28.9	16.7	5.5	—11.2	43.2	24.1	54.9	38.8	60.8	43.7
18	.....	.....	69.6	50.2	54.1	40.4	39.9	35.1	30	19.8	13.7	— 7.1	24.7	6.9	24.5	9.7	11.3	—11.7	45.6	26.1	44.8	36.9	68.8	45.4
19	.....	.....	60.4	44.2	49.8	44.8	40.7	32.7	27.2	18.3	7.7	— 0.6	19.9	11.4	24.7	10.4	20.9	8.1	45.2	27.4	51	35.3	68.4	47.4
20	.....	.....	62.7	46.8	47.8	42	45.8	35.2	33	20.1	5.2	— 0.4	38.8	10	24	9.9	26.7	4.7	36.8	30	52.7	35	64.1	43.9
21	.....	.....	52.4	42.9	48.1	37.4	48.1	31.1	31.2	21.2	5.4	— 1.2	14.3	6.5	30.8	4.9	30	22	39.6	29.1	54.1	32.5	53.9	44.5
22	.....	.....	50.3	40.9	55.2	39.9	51.9	37.8	33.5	25.8	13	(†)	19.3	3	39.1	22.9	37	22.5	48.2	28.8	58.5	38.7	56.9	42.3
23	.....	.....	55	40.8	52.9	41.2	58.5	36.9	37.9	31.1	16.8	.....	18.9	4.7	28.4	16	24.9	18.9	56.5	34	49.3	38.1	56.4	42.9
24	.....	.....	64.9	43.2	52.3	42.8	60.4	40.5	36	28	14.9	.....	17.8	— 1.8	29.3	15.7	29.9	19.6	60.8	35.6	44.9	38.9	59.9	42.3
25	.....	.....	57.4	45	58.3	41.2	48.8	35.7	29	22.1	12.9	.....	4.4	—13	28.8	24.5	22	5	44.1	33.3	47.8	38	55.3	44
26	.....	.....	62.7	42.6	68.9	49.5	41.7	35.7	35.5	25.2	12.7	.....	6.4	—10.2	29	12.5	39.2	20.1	50.8	30.5	50.4	37.8	59.3	43.3
27	.....	.....	52.5	42.3	.....	41.2	38.9	34.5	31	25.2	14.2	.....	8.9	— 3.6	20.2	— 0.6	43.9	28.7	43.1	30.4	55.6	38	68.9	42.2
28	.....	.....	56.7	43	49.2	43.8	36	29.7	29.8	22	21.7	.....	10.9	—11.3	27.2	5.2	41.9	29.9	46.9	32.3	61.4	46.3	64.7	46.8
29	.....	.....	57.9	44	61.9	45.5	40.3	31.2	30	17.3	16.7	.....	24.1	8.7	.....	.....	32.4	22.9	55.1	31.9	61.3	47.1	81.5	50
30	.....	.....	58.2	46.2	52.6	45.4	37	29.2	19	14.1	28.4	.....	30.9	20.6	.....	.....	36	21.7	49.8	33.3	67.7	51.1	66.4	52.5
31	.....	.....	65.3	47	.....	.....	39.4	28.6	.....	.....	20.9	.....	31.7	22.8	.....	.....	32	20	.....	.....	66.6	42.4	.....	.....
Range	.....	.....	.....	.....	.....	.....	36°.3		34°.7		.....	.....	.....	.....	39°.7		64°		50°.7		40°.0		39°.7	
Monthly means	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* No maximum and minimum thermometer readings taken. † Minimum thermometer broken.

Maximum, minimum, and mean temperatures—Continued.

STATION, FORT GARRY, MANITOBA.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	86.0	48.7	84.0	67.4	66.6	44.4	67.0	25.0	40.5	30.0	0.0	−28.6	− 7.4	−27.3	18.4	4.2	30.4	4.4	17.	− 5.3	54.2	32.5	62.4	50.
2	75.0	58.3	87.7	54.3	75.0	40.0	52.0	36.5	36.0	30.0	12.0	− 8.3	− 4.2	−25.5	25.0	− 2.4	10.0	− 8.3	18.	−14.3	58.3	30.3	56.	44.
3	74.3	54.0	82.4	60.0	67.0	42.0	38.6	24.2	34.0	16.5	14.0	−10.3	2.0	−23.5	32.0	10.2	7.5	−17.3	33.	6.3	54.5	31.	59.	40.9
4	77.4	48.0	91.0	51.5	69.5	39.0	42.0	20.0	21.5	4.4	20.0	− 1.2	20.0	−16.0	33.0	10.6	2.5	−14.3	19.	−10.3	59.	33.2	68.5	44.
5	83.6	46.4	79.0	61.0	72.0	41.0	41.4	28.0	21.5	5.2	38.5	4.5	20.0	− 2.2	32.0	10.2	13.5	−20.3	25.0	0.3	55.	40.	77.	42.5
6	80.0	64.5	82.5	52.0	60.0	50.0	40.0	18.0	27.5	6.4	23.0	− 8.3	8.0	− 5.2	36.0	15.0	8.0	−14.3	22.	−12.5	50.5	34.	70.	50.
7	76.0	59.0	86.8	57.4	62.4	46.0	36.0	20.0	36.5	10.0	− 2.2	−17.7	− 5.2	−28.5	31.0	5.2	0.0	−26.3	31.	14.	54	29.4	73.5	50.
8	94.5	63.0	95.0	64.0	57.4	41.0	40.0	15.0	56.0	22.5	− 4.0	−34.3	−18.4	−37.3	28.0	4.2	4.0	−18.3	33.	−11.5	64.3	29.4	56.5	33.
9	75.0	54.5	92.5	64.3	58.0	48.4	50.0	26.0	50.4	24.0	− 4.6	−38.3	− 4.4	−31.0	35.5	16.4	10.0	−10.3	45.	5.5	72.	30.	60.	34.4
10	73.4	52.0	71.0	55.0	63.4	48.0	36.5	24.0	63.6	28.5	−10.0	−18.3	−11.4	−26.3	24.4	2.5	15.0	− 9.3	34.2	34.	71.5	42.	68.	39.5
11	79.3	50.0	77.5	49.5	68.4	37.5	55.6	20.2	37.0	18.0	35.0	7.5	−21.8	−40.3	8.4	−11.0	13.0	− 7.5	52.	33.	68.	44.3	72.5	43.
12	78.0	53.4	70.3	57.5	70.3	39.4	36.5	24.0	18.0	11.5	32.0	8.1	− 4.2	−35.3	18.4	−25.3	19.5	−12.5	53.	25.5	79.	46.5	70.	44.
13	80.3	49.5	58.0	51.0	69.0	40.0	52.5	22.0	12.0	− 5.2	28.0	−10.3	12.0	−30.3	25.0	13.5	25.0	4.5	54.	32.4	76.5	45.	57.	34.5
14	82.0	51.0	68.0	42.0	70.0	37.0	38.0	15.0	13.4	− 6.3	4.0	−28.3	−18.4	−44.3	34.5	15.3	18.5	−11.3	49.5	33.	68.3	55.	65.4	36.
15	81.0	54.5	65.0	43.0	73.0	38.5	46.0	20.0	12.0	− 1.2	10.4	−28.3	−16.4	−39.0	25.5	−16.4	12.0	−15.0	44.	36.	68.5	52.	67.0	35.
16	92.0	59.0	70.5	45.0	69.4	52.0	57.5	22.0	19.5	4.4	7.0	−35.3	−13.4	−39.3	10.4	−15.3	2.0	−21.3	49.	28.4	71.5	41.	75.5	49.
17	74.0	56.0	80.0	43.4	74.0	48.0	64.0	28.0	31.5	10.1	− 1.0	−36.3	− 6.4	−20.0	33.5	2.5	8.5	−12.3	57.2	29.	63.5	41.	80.4	50.
18	88.0	50.0	78.0	56.0	69.5	40.4	68.0	32.0	28.0	−10.2	8.4	−24.3	− 8.5	−30.3	37.4	14.7	8.6	−20.3	57.5	30.4	64.	33.4	66.5	46.
19	78.4	61.0	76.0	45.0	74.0	39.0	60.0	42.5	25.4	−13.3	− 9.5	−29.3	0.0	−18.5	34.5	6.3	20.0	0.5	64.4	29.	62.	42.	57.5	41.
20	77.0	45.4	77.4	39.0	68.0	47.0	53.3	45.0	26.0	5.2	− 2.2	−22.5	− 9.6	−36.3	40.0	22.0	23.0	4.5	68.	33.5	72.	54.	66.	49.4
21	70.0	51.0	72.0	65.5	72.5	42.0	49.0	36.0	14.0	− 4.2	−12.4	−30.3	1.0	−16.3	39.5	25.0	18.5	− 5.3	69.2	38.	59.4	46.	68.5	49.
22	71.5	39.0	76.0	66.4	68.0	42.0	33.0	34.0	16.0	8.4	−10.4	−28.3	0.0	−30.0	32.5	4.3	10.4	−15.3	59.5	36.	66.3	44.	64.5	46.5
23	75.7	44.4	74.4	58.5	67.3	40.0	42.4	27.0	15.5	− 3.4	− 1.0	−15.0	14.0	− 8.3	20.0	− 4.3	17.0	−14.5	38.3	26.5	74.4	40.	78.	55.4
24	81.5	47.0	60.0	52.0	59.4	42.9	37.6	25.0	24.0	12.3	2.0	−10.3	3.5	−21.5	21.0	− 2.4	21.0	−14.3	58.4	25.	78.	42.5	64.3	55.
25	84.0	53.3	61.0	46.0	60.0	34.0	36.5	25.0	27.0	9.5	− 5.2	−24.5	20.0	−10.3	23.5	14.3	32.	− 3.3	44.5	27.	81.5	43.	72.	51.5
26	77.0	60.0	69.0	31.5	60.4	30.0	34.6	24.4	29.3	12.3	6.0	−18.4	27.5	10.2	27.0	0.2	31.5	12.3	48.	22.	76.	49.	68.5	54.5
27	83.0	54.0	78.5	54.0	68.0	42.0	49.3	25.0	12.4	−10.5	2.0	−16.5	33.0	6.2	33.4	0.2	37.5	4.3	50.	24.	73.3	56.4	69.4	54.
28	89.3	56.0	81.5	50.0	50.0	36.0	56.5	28.0	− 4.6	−18.3	1.0	−10.3	40.0	16.5	34.0	6.7	42.	9.5	50.	25.	82.0	54.5	77.	55.5
29	92.0	56.5	79.5	58.4	46.5	32.0	60.5	35.0	− 1.6	−16.7	7.2	−26.5	29.0	8.2	.....	.....	43.5	26.5	52.	25.	81.4	58.0	71.	53.5
30	93.3	57.0	74.0	54.0	48.0	25.0	58.0	28.4	−13.0	−32.3	2.0	−28.3	30.0	10.2	.....	.....	38.5	32.	56.4	30.	74.0	46.5	71.5	53.5
31	92.4	69.0	65.0	47.5	.....	.....	49.5	30.0	.....	.....	− 2.2	−18.7	28.0	8.2	.....	.....	36.	12.3	.....	.....	64.	44.5	.....	.....
Range	55°.5		63°.5		50°.0		53°.0		95°.9		76°.8		84°.3		65°.3		69°.8		83°.8		52°.6		47°.4	
Monthly means	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

Maximum, minimum, and mean temperatures—Continued.

STATION, FORT GIBSON, IND. T.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	76	66	85	66	87	71	61	35	71	50	26		36	9	62	52	50	42	63	45	73	47	86	66
2	86	59	88	68	89	67	74	36	50	36	40		29	12	65	51	46	38	56	34	78	55	87	71
3	91	71	89	64	89	70	70	45	58	29	45		33	0	60	41	61	26	55	46	64	52	83	66
4	92	72	91	67	95	70	59	48	57	46	42	23	43	22	56	34	36	22	71	46	52	43	76	67
5	83	74	92	68	95	73	67	46	65	48	51	17	41	36	59	29	48	28	83	44	72	39	82	59
6	92	75	95	70	95	75	72	45	63	36	58	36	37	29	59	32	62	28	69	49	63	54	86	66
7	91	74	93	69	94	74	67	40	52	27	52	24	47	16	60	41	43	48	76	54	66	46	79	65
8	88	74	95	70	94	77	69	46	62	34	52	19	23	6	47	42	55	18	59	52	71	43	82	62
9	80	67	91	70	91	72	68	51	64	35	28	14	39	15	48	34	26	15	61	43	75	50	68	54
10	86	67	89	71	75	57	74	50	68	34	45	17	49	30	59	28	49	19	53	41	77	58	76	46
11	90	68	87	69	78	52	64	39	72	52	65	22	65	37	55	41	60	15	61	43	71	61	73	56
12	91	74	93	72	89	53	70	39	76	62	68	27	37	13	49	41	62	42	54	50	65	61	80	51
13	93	76	92	73	74	63	76	42	68	30	56	42	27	10	43	39	64	33	67	47	76	60	87	64
14	94	74	92	74	76	54	63	46	30	25	49	32	41	27	47	37	55	40	71	42	84	65	88	67
15	96	72	93	70	76	42	55	33	35	27	53	17	53	14	48	41	66	32	79	60	75	63	90	70
16	94	73	95	71	79	50	60	32	51	34	50	28	22	6	51	40	70	39	75	58	78	67	93	70
17	92	73	96	71	83	53	62	39	52	36	57	21	47	22	56	26	51	31	69	63	77	67	95	73
18	93	72	97	71	82	59	76	54	48	38	29	9	48	39	64	37	74	36	73	56	83	68	91	72
19	95	70	96	71	78	61	74	61	45	26	47	17	46	32	55	41	74	55	57	59	84	64	92	72
20	95	70	95	73	76	61	71	46	65	32	51	27	47	26	58	31	75	47	67	47	84	62	92	74
21	92	72	95	73	78	55	60	45	55	36	47	20	43	23	58	28	65	36	74	49	88	59	91	70
22	93	69	95	72	82	55	59	41	51	33	44	24	45	31	54	42	77	49	80	58	91	67	87	65
23	98	70	96	71	90	60	74	34	55	26	33	26	38	20	45	39	67	35	73	64	92	66	87	70
24	84	69	96	71	91	64	66	45	54	31	30	18	42	19	48	32	36	26	70	60	80	65	85	63
25	77	63	89	66	96	63	72	36	59	25	22	16	39	29	55	28	54	25	63	57	77	59	91	77
26	82	67	81	65	84	67	81	45	70	31	22	15	47	30	57	32	77	36	68	57	77	59	83	66
27	87	70	86	68	78	51	78	62	49	33	33	19	56	24	57	27	80	57	69	50	80	57	82	64
28	93	69	90	68	78	46	81	68	48	36	34	18	60	25	53	36	66	56	53	43	60	62	88	71
29	97	74	91	74	63	45	80	67	42	31	18	— 2	58	41	.....	.....	63	53	57	36	86	64	92	75
30	89	72	95	75	58	40	82	67	32	20	26	— 9	60	53	.....	.....	74	51	65	35	83	39	92	76
31	89	68	98	74	.....	.....	81	67	.....	.....	33	13	70	48	.....	.....	74	53	.....	.....	83	72	.....	.....
Range	39°		34°		56°		50°		56°		77°		70°		39°		65°		49°		53°		49°	
Monthly means	81°.0		81°.4		71°.8		58°.4		44°.8		29°.9		33°.7		44°.8		49°.2		57°.9		68°.2		75°.3	

Maximum, minimum, and mean temperatures—Continued.

STATION, FORT SILL, IND. T.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	76	64	95	72	86	68	62	32	61	42	33	14	34	21	57	50	48	39	59	42	78	46	86	63
2	85	61	83	72	80	62	75	39	52	38	42	18	29	13	60	46	53	35	56	34	78	52	85	69
3	90	71	86	70	89	68	71	48	58	34	45	21	35	20	61	45	49	28	73	41	60	48	81	64
4	91	72	91	72	91	70	70	45	66	45	43	24	40	19	58	37	43	24	73	46	62	43	85	61
5	91	72	94	70	93	70	73	41	75	56	53	22	42	33	58	38	42	24	84	49	77	48	86	59
6	91	73	95	73	93	68	77	45	59	42	51	28	48	25	55	41	64	29	84	55	69	50	88	66
7	88	73	95	71	94	70	71	47	62	34	50	24	49	18	52	44	75	49	77	56	71	45	85	68
8	89	75	95	74	93	70	63	52	70	36	55	23	31	10	47	39	38	20	66	53	73	49	85	58
9	90	72	92	67	85	69	76	56	63	43	30	13	47	17	48	37	34	17	60	43	78	54	67	50
10	86	70	87	69	78	56	74	51	60	50	53	15	50	30	60	31	53	23	64	44	76	60	79	46
11	92	76	88	65	83	54	65	39	62	47	54	24	58	27	50	42	69	47	57	41	72	60	72	54
12	91	72	94	73	90	57	73	44	72	49	67	34	20	10	33	28	62	45	57	46	72	60	84	56
13	95	73	94	74	75	59	78	51	53	22	58	33	30	16	34	28	67	33	64	43	76	52	87	58
14	93	74	90	75	78	54	62	46	29	20	53	36	44	23	39	31	56	37	71	46	80	59	83	59
15	94	72	89	70	81	59	57	32	37	16	51	22	23	13	47	36	63	34	73	49	81	59	88	60
16	94	73	93	72	84	56	62	36	48	28	48	24	27	8	49	36	61	41	74	57	73	64	93	66
17	92	75	94	71	81	59	67	49	50	34	38	23	49	17	53	29	55	26	76	61	79	68	91	66
18	92	73	96	70	85	61	70	52	51	37	31	10	43	29	63	34	77	35	65	52	74	54	89	65
19	93	73	98	71	82	63	82	46	50	29	49	15	43	27	53	38	74	46	67	49	73	56	90	68
20	94	72	95	72	78	58	71	40	63	34	51	25	37	19	53	33	75	55	72	47	76	55	92	68
21	92	74	96	73	79	49	60	48	52	38	47	24	35	24	60	28	72	40	80	54	86	58	74	68
22	96	70	95	71	90	53	67	40	44	30	50	27	42	22	56	33	82	49	75	60	86	64	84	62
23	97	75	96	72	93	61	70	41	50	27	27	19	40	14	55	37	40	30	71	58	86	65	89	64
24	97	75	97	71	89	61	72	43	57	28	20	5	45	20	54	28	47	33	67	55	84	63	92	73
25	80	66	77	65	87	64	67	52	62	34	25	3	50	20	57	34	66	36	63	54	81	63	94	70
26	85	69	82	62	89	61	80	48	62	35	23	9	51	30	58	33	83	39	74	58	76	61	88	67
27	94	72	88	68	81	58	81	50	51	33	28	17	59	28	56	32	84	50	60	46	79	60	90	70
28	96	71	91	69	85	58	82	63	51	32	20	16	61	27	47	36	72	57	59	42	81	63	92	74
29	100	75	88	72	62	47	85	60	47	37	20	3	64	49	.....	.....	74	59	59	40	84	61	93	67
30	99	72	95	69	62	44	83	59	37	22	29	0	59	48	.....	.....	79	61	68	37	83	67	94	69
31	95	75	96	67	.....	.....	70	61	.....	.....	29	20	60	43	.....	.....	77	55	.....	.....	82	62	.....	.....
Range	39°		36°		50°		53°		59°		67°		56°		35°		67°		50°		43°		48°	
Monthly means	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, FORT SULLY, DAK.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	80	55	90	74	76	53	71	23	(*)	(*)	22	— 1	14	— 1	47	36	36	26	29	12	69	38	58	43
2	88	56	90	71	89	58	67	39	.....	.....	23	4	24	— 8	46	25	28	7	35	17	55	43	64	42
3	83	60	97	68	86	56	49	36	.....	.....	23	3	28	14	43	27	30	9	49	26	58	35	75	44
4	85	56	93	63	66	54	47	32	.....	.....	31	4	39	23	43	32	31	9	47	27	71	44	63	50
5	88	52	82	63	70	59	65	40	.....	.....	50	8	38	29	49	29	41	6	57	39	56	48	75	50
6	95	68	92	54	72	57	56	40	.....	.....	38	18	39	15	46	31	34	16	65	33	61	36	71	54
7	103	60	107	72	70	55	60	38	52	.....	37	24	17	— 8	40	26	21	— 9	62	41	64	36	75	44
8	96	76	104	79	59	50	63	27	63	39	35	— 8	15	—10	42	20	9	—13	46	28	68	49	63	45
9	91	60	102	60	58	49	73	35	70	27	25	— 3	24	9	51	26	16	— 7	54	27	75	51	74	38
10	101	67	79	51	61	50	52	27	68	26	42	12	20	3	49	23	21	—17	56	27	61	52	66	54
11	90	64	99	58	60	53	59	28	46	26	51	40	9	—16	24	13	24	— 1	49	34	60	54	70	54
12	85	64	91	64	59	52	61	30	26	14	56	35	6	—16	34	3	33	14	58	41	69	48	67	50
13	80	59	77	60	66	50	58	34	16	— 4	40	27	29	—16	45	21	38	13	70	37	59	52	71	47
14	80	62	70	53	71	46	43	21	22	— 2	35	— 3	22	—11	46	23	26	4	70	47	79	55	72	54
15	85	61	76	57	78	48	71	26	38	7	43	0	15	—16	45	27	22	16	68	40	74	52	77	47
16	92	70	70	59	81	60	71	31	37	20	20	— 3	4	—20	50	18	17	2	62	41	76	48	91	53
17	91	63	70	63	75	51	72	32	34	15	14	— 3	8	— 5	58	26	27	9	52	45	73	56	100	69
18	94	64	86	60	77	56	72	38	23	6	35	— 2	10	—15	54	34	39	9	49	43	74	56	79	69
19	88	74	81	61	72	53	55	45	38	15	19	1	20	—20	47	25	37	20	65	37	75	57	78	83
20	91	58	81	60	71	43	49	44	37	20	24	7	31	— 1	62	31	39	20	70	40	61	45	81	60
21	99	67	91	69	84	51	47	36	36	15	36	14	25	8	50	33	44	25	66	50	70	49	88	55
22	80	64	88	65	73	56	58	28	34	22	16	— 1	13	— 8	42	29	25	14	52	35	59	51	94	63
23	82	63	84	61	81	45	56	40	43	16	— 1	— 8	25	4	39	19	23	12	46	30	65	52	90	57
24	85	56	78	55	70	54	52	32	44	32	9	— 4	26	3	39	20	41	18	61	32	67	55	81	49
25	85	62	75	48	71	47	53	26	38	27	3	—11	35	1	36	19	55	31	63	42	64	53	84	51
26	84	68	83	56	71	44	55	30	42	32	— 4	—26	39	15	29	20	41	30	54	36	72	53	81	47
27	83	53	88	60	80	47	63	30	37	28	24	—18	44	20	36	21	36	28	54	32	80	53	81	60
28	96	64	85	66	63	43	(*)	(*)	30	18	10	— 3	38	14	43	19	40	29	53	28	89	60	86	56
29	102	59	84	64	52	37	.....	.....	18	6	0	—21	35	12	.....	.....	50	36	56	30	89	66	99	60
30	101	75	92	64	53	25	.....	.....	15	— 6	13	—12	40	17	.....	.....	50	38	68	31	84	61	78	57
31	103	74	76	59	....	..	.....	.....	.....	.....	15	—13	46	31	.....	.....	44	29	.....	.....	64	46	.....	.....
Range	51°		59°		64°		.....	.....	.....	.....	82°		66°		59°		72°		58°		54°		62°	
Monthly means	75°.6		73°.1		58°.6		.....	.....	.....	.....	13°.7		13°.9		33°.4		23°.8		44°.7		58°.6		63°.6	

*No observations taken between October 28 and November 7; observer absent from station.

Maximum, minimum, and mean temperatures—Continued.

STATION, GALVESTON, TEX.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	94	80	94	82	93	81	67	57	82	71	43	33	46	30	62	55	61	48	78	68	75	59	87	76
2	94	80	85	71	92	79	75	59	75	55	44	35	53	38	68	58	63	54	72	61	77	61	87	75
3	94	81	88	74	92	79	80	68	63	53	52	43	51	35	64	58	69	56	75	66	78	68	87	75
4	94	80	92	78	92	79	84	72	74	63	50	44	52	37	62	53	66	59	78	66	73	62	86	76
5	93	81	93	79	93	79	87	74	75	66	49	42	56	46	62	55	62	47	78	68	78	63	88	77
6	92	81	90	78	93	80	85	74	72	64	56	46	52	42	60	52	60	46	78	69	77	69	89	78
7	85	76	93	81	94	81	82	72	64	52	60	54	61	46	63	54	69	59	77	70	77	64	85	80
8	91	80	92	76	94	81	75	61	66	56	57	49	59	34	66	54	70	55	77	65	82	65	88	79
9	93	80	91	79	92	80	73	61	66	57	60	48	50	34	59	49	55	39	78	59	74	66	83	68
10	94	79	87	77	93	77	79	64	70	58	68	57	63	49	58	47	59	49	75	61	76	64	75	64
11	93	79	92	80	83	74	78	68	74	63	65	51	64	56	62	52	68	58	73	64	77	68	81	68
12	96	81	84	77	83	74	73	59	74	69	58	49	68	49	61	57	72	61	69	59	76	65	82	70
13	94	81	84	76	84	75	75	64	76	51	69	57	49	39	60	50	70	58	71	56	80	70	52	73
14	94	80	85	75	86	74	79	66	57	40	70	60	57	43	54	48	69	60	78	60	80	71	90	76
15	93	79	91	77	82	71	72	60	46	39	60	50	60	53	55	48	72	61	78	62	82	72	88	79
16	92	81	93	79	81	70	65	51	55	45	56	49	53	38	51	47	73	64	76	65	81	71	86	79
17	89	80	92	80	85	68	74	61	61	52	66	54	48	39	55	48	68	56	74	68	82	72	84	77
18	94	79	91	80	88	71	82	65	62	53	65	42	54	46	58	50	66	55	79	68	82	71	89	78
19	95	77	91	79	84	70	80	68	61	48	50	35	62	52	65	55	72	59	79	61	83	69	91	78
20	93	77	93	81	86	74	82	72	66	54	62	50	66	58	60	51	73	63	82	63	85	72	91	80
21	94	80	93	80	82	70	82	63	70	61	65	57	58	49	57	46	75	62	80	66	85	72	91	80
22	94	81	94	80	86	71	68	60	65	57	62	57	50	45	63	51	72	59	73	68	87	73	89	77
23	93	81	93	80	87	73	74	60	64	45	57	47	51	43	63	49	71	64	77	68	90	73	90	79
24	95	81	86	80	86	77	79	76	50	46	52	37	53	39	59	49	66	44	71	54	91	73	92	81
25	94	75	90	76	86	76	78	67	50	44	37	30	53	48	59	51	65	45	70	62	88	76	89	80
26	91	80	91	79	88	76	80	69	65	48	41	32	54	49	59	53	70	52	78	69	86	74	92	81
27	89	80	82	76	82	76	80	71	70	59	52	40	59	49	59	48	72	60	79	70	89	74	91	81
28	92	80	91	80	79	67	81	72	69	61	50	34	59	49	63	53	75	64	72	57	89	75	91	80
29	93	80	94	80	80	68	80	72	65	56	38	26	58	49	.....	.....	75	65	67	57	86	75	91	80
30	95	81	93	80	75	62	80	71	56	40	50	27	62	54	.....	.....	75	66	69	56	86	74	91	80
31	94	80	92	82	.....	.....	79	72	.....	.....	58	35	64	57	.....	.....	75	60	.....	.....	86	76	.....	.....
Range	21°		23°		32°		36°		43°		44°		38°		22°		36°		28°		32°		28°	
Monthly means	85°.0		83°.7		79°.4		71°.6		60°.1		50°.2		50°.7		56°.2		62°.1		68°.8		74°.8		81°.5	

Maximum, minimum, and mean temperatures—Continued.

STATION, GRAND HAVEN, MICH.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	68	60	79	65	73	62	54	43	56	50	27	17.5	30	20	40	33	46	23	57	35	40	33	78	64
2	73	64	84	61	65	50	60	51	53	40	33	24	26	19	36	25	37	33	35	24	45	34	75	57
3	78	61	78	64	70	49	58	46	46	41	35	23	24	16	37	30	33	22	46	21	50	33	67	55
4	73	62	81	66	67	55	59	42	47	41	34	25	23	18	36	22	30	18	52	34	53	35	67	51
5	69	61	80	68	60	48	50	40	52	42	36	28	27	18	42	30	28	20	40	32	63	39	69	55
6	79	60	77	70	58	53	53	39	49	42	38	36	37	23	40	35	40	23	43	33	64	40	74	55
7	82	70	75	65	66	54	51	38	43	35	36	24	34	17	42	32	35	16	56	35	60	45	76	54
8	85	72	76	57	66	57	44	35	40	33	24	8	17	11	44	26	25	15	52	36	55	42	80	62
9	87	74	89	63	61	53	58	33	46	26	9	0	18	9	45	22	19	13	55	39	50	41	67	49
10	75	69	83	70	59	57	55	36	48	28	8.5	0	32	18	44	34	27	15	61	37	55	42	57	46
11	78	68	77	70	66	55	45	32	55	31	32	1	30	8	45	36	37	27	55	40	62	40	65	49
12	79	69	79	68	64	51	51	28	58	39	41	31	10	— 3.5	36	19	33	24	57	39	64	47	64	50
13	82	68	83	69	65	48	55	46	57	37	40	36	25	9	35	12	37	9	54	35	68	46	62	53
14	83	70	83	73	58	51	46	30	37	29	37	15	28	17	43	17.5	35	21	49	35	73	47	71	51
15	78	64	73	62	61	48	42	29	41	24	33	14	22	12	45	35	30	22.5	61	36	72	58	76	63
16	83	61	77	64	67	45	51	40	42	35	15	— 4	23	10	39	27	28	10	56	45	71	54	65	56
17	82	68	75	66	69	49	54	38	43	34	8	0	25	16	31	22	25	2.5	54	44	69	58	71	57
18	79	70	78	64	64	53	63	36	43	37	22	6	32	16	46	24	27	17	53	48	68	55	74	59
19	86	67	79	64	71	51	62	44	47	38	22	10	33	30	36	23	32	15	49	45	81	65	70	60
20	80	68	69	56	75	56	64	51	52	43	22	8	32	13	39	20	31	14	57	41	86	61	76	54
21	72	61	68	49	76	63.5	60	53	53	38	34	17	28	14	46	34	40	25	57	42	72	55	67	57
22	72	57	75	55	71	59	58	52	38	33	27	19	28	14	55	38	52	32	67	41	62	47	64	53
23	64	52	82	67	70	59	53	48	34	30	26	14	22	12	44	33	32	24	75	51	58	44	71	50
24	66	50	83	72	69	56	51	43	34	29	19	7	24	15	36	28	29	19	52	41	51	41.5	77	60
25	70	54	72	61	66	55	43.5	40	36	30	30	13	35	20	37	28	36	20	57	40	56	46	79	60
26	75	53	64	51	61	48	43	31	40	27	31	20	38	29	35	22	39	14	61	44	62	46	71	59
27	72	66	69	44	54	47	48	26	37	31	30	22	43	25	36	27	38	28	56	41	64	46	69	56
28	73	62	71	47	61	46	55	38.5	35	31	27	18	40	18	35	25	36	28	43	39	69	48	72	60
29	76	64	71	58	51	43	48	43	37	27	25	11	45	28	.....	.....	37	23	43	36	77	51	77	62
30	78	62	76	64	49	42	64	45	27	18	27	16	47	27	.....	.....	47	28	41	33.5	78	66	74	66
31	78	61	77	63	.....	.....	64	50	.....	.....	28	19	46	39	.....	.....	51	37	.....	.....	82	67	.....	.....
Range	37°		40°		34°		38°		40°		45°		50°.5		43°		49°.5		54°		53°		34°	
Monthly means	71°.1		70°.5		58°.6		47°.1		39°.0		21°.9		24°.2		32°.6		28°.0		45°.4		57°.0		63°.4	

Maximum, minimum, and mean temperatures—Continued.

STATION, HALIFAX, N. S.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	75.3	52.4	73.7	56.9	72.	45.7	57.9	45.9	47.3	35.	25.2	17.9	24.	5.	34.8	26.	34.6	20.	46.3	25.5	48.	39.	90.8	48.1
2	63.3	.....	77.7	53.3	69.4	57.3	58.3	41.8	51.8	35.	39.	22.	27.	11.2	37.	32.	32.5	13.5	51.4	22.2	63.2	43.	62.8	45.2
3	69.4	55.9	79.9	51.4	70.2	50.7	56.9	37.	55.8	44.	34.	25.2	20.8	10.4	33.1	26.	42.3	29.5	44.	29.9	46.6	39.4	78.9	44.
4	66.6	55.	83.6	54.3	72.	49.5	70.	39.1	52.8	33.7	34.	21.8	12.4	3.8	33.1	25.3	40.	26.8	44.9	29.5	56.2	36.5	71.9	50.
5	82.8	57.7	81.4	52.	69.7	47.7	64.9	50.	46.6	27.	37.7	17.9	27.	7.1	42.1	24.	36.9	20.5	46.3	31.8	62.9	37.9	78.9	52.5
6	75.6	55.2	90.2	59.4	58.4	43.4	58.	44.8	41.3	25.1	35.8	20.	23.	14.5	35.	26.2	34.7	19.9	44.1	36.1	59.9	33.7	74.9	54.1
7	78.9	50.8	90.2	66.8	67.9	43.5	65.6	49.9	47.2	30.1	37.7	24.1	41.5	19.	33.	24.5	34.3	13.	41.	34.	45.8	35.3	64.	50.
8	70.	52.4	82.4	66.1	67.	42.	54.8	39.2	60.2	39.3	37.7	28.2	38.5	27.	34.5	27.5	32.7	12.8	41.3	32.4	47.1	34.7	56.4	51.6
9	76.2	55.7	88.9	63.	59.9	45.	56.8	34.1	62.8	32.3	37.	22.8	42.8	10.	30.4	19.8	52.	32.	46.8	32.1	47.	36.8	58.8	47.6
10	67.	53.2	88.	59.4	60.	42.8	56.9	33.1	56.1	53.9	24.9	14.4	16.9	1.	26.8	11.	46.	22.4	43.	32.9	41.2	34.1	63.4	50.5
11	79.3	56.	88.7	60.3	72.2	42.2	56.1	39.5	50.2	53.9	15.	5.1	30.	13.1	34.8	14.3	33.9	18.1	46.5	30.1	48.	32.	69.3	54.7
12	68.7	56.5	85.2	57.4	70.	45.	52.	32.	50.3	44.1	34.8	5.1	30.8	0.	33.2	11.	34.9	20.	42.9	28.5	54.9	30.9	60.	51.6
13	86.7	52.9	84.8	63.	70.	41.4	59.2	36.7	46.7	41.7	39.	25.	14.5	1.8	35.	18.	34.6	21.8	41.	27.	69.	31.8	67.5	53.1
14	85.7	58.4	80.2	60.2	70.8	40.6	51.	31.	48.8	39.8	39.5	32.5	29.5	4.	20.4	13.	32.	18.9	49.8	24.	77.7	38.	71.6	51.9
15	82.4	61.1	82.6	61.1	64.8	47.1	54.	41.3	42.8	34.8	39.1	21.	14.8	— 8.	34.8	13.	34.1	16.5	53.9	24.	69.9	42.	81.2	56.
16	83.2	54.8	73.8	55.6	63.2	40.9	42.2	31.9	46.7	32.2	39.2	6.	21.8	10.4	46.8	19.5	32.9	22.1	56.8	29.8	68.5	37.	69.7	50.8
17	76.1	55.9	74.	51.3	63.1	37.2	50.3	37.7	34.2	28.2	7.	— 1.	14.2	— 1.	51.	30.5	31.3	18.2	56.4	29.5	50.	37.	73.6	50.9
18	74.3	58.	74.3	51.9	60.6	43.6	42.9	33.5	36.2	25.7	33.6	1.	26.6	— 2.9	41.8	22.2	41.1	16.4	64.8	28.5	50.2	36.8	76.8	52.3
19	82.8	60.	72.7	52.3	55.2	46.8	52.1	29.	35.2	26.3	43.	18.2	31.5	14.	32.6	14.	46.8	17.5	46.7	30.	56.8	36.9	69.8	51.8
20	74.4	57.8	74.7	53.2	53.3	48.	52.1	31.	39.	26.5	21.	11.	42.7	17.2	29.	16.8	35.5	16.	46.9	35.4	64.8	34.1	70.2	44.5
21	71.1	57.4	66.3	46.7	62.5	44.3	52.2	34.1	39.	36.5	20.1	7.8	40.2	13.8	34.	8.5	38.1	19.1	56.9	44.1	69.9	32.	70.1	43.
22	72.5	54.	62.3	47.	68.7	39.7	51.3	43.3	45.	32.3	19.2	9.1	29.	12.	39.9	11.	46.	37.5	56.4	36.8	69.8	40.	72.9	47.5
23	71.3	52.8	72.1	46.4	71.1	41.1	60.2	47.2	40.	34.9	22.9	15.	29.8	19.2	41.	24.1	50.5	33.2	62.6	37.1	53.5	41.9	69.8	43.1
24	60.9	54.4	73.1	48.	65.	45.3	60.1	48.8	40.1	35.8	22.1	15.	28.	11.	41.2	29.6	54.5	29.8	54.3	37.6	47.9	39.9	65.3	48.4
25	71.4	56.6	73.2	47.4	56.4	51.2	63.7	44.1	39.9	35.5	18.8	5.	24.8	— 4.2	38.	32.	36.9	25.	73.	38.9	52.8	40.3	69.8	48.5
26	70.8	58.4	65.	59.5	56.3	46.9	56.6	40.9	39.8	31.	30.8	5.	7.8	—10.	35.	20.	40.1	27.5	51.5	39.5	50.9	40.6	73.4	51.4
27	72.8	53.	75.8	51.4	57.1	48.1	52.8	36.1	39.8	30.2	27.9	9.	36.2	7.6	24.1	8.	43.	32.	60.2	36.1	49.4	38.5	66.4	44.4
28	71.7	49.2	69.8	49.8	62.6	46.1	40.2	32.3	34.8	26.2	28.	13.	25.3	— 2.	35.4	14.	46.4	37.1	56.3	33.	70.4	36.8	72.4	40.8
29	74.3	54.	72.9	47.1	62.5	41.8	47.2	31.3	35.5	26.1	24.8	9.	20.	— 7.5	.....	.....	41.8	34.3	49.8	36.8	79.	47.	77.4	45.4
30	81.6	59.3	72.	47.9	65.	53.9	41.9	27.8	29.	18.2	37.	17.4	34.5	13.1	.....	.....	47.8	33.2	46.8	36.6	75.3	45.1	72.2	47.1
31	67.6	60.1	73.7	48.	.....	.....	49.1	27.	.....	.....	31.	4.	39.7	15.6	.....	.....	42.8	26.2	.....	.....	77.2	45.1	.....	.....
Range	.....		43°.8		35°		43°		44°.6		44°		52°.8		38°.8		41°.7		49°.8		48°.1		50°	
Monthly means	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, INDIANAPOLIS, IND.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	85	66	83	61	77	62	54	37	73	58	18	9	20	8	63	45	50	29	71	40	51	33	84	66
2	80	70	83	65	72	55	61	45	64	43	29	9	17	— 4	56	44	47	36	45	30	55	31	81	65
3	86	69	86	67	76	51	56	46	45	41	30	18	15	— 4	44	32	46	28	50	28	51	42	80	67
4	84	70	84	69	81	64	56	38	49	32	33	19	21	— 8	39	31	28	9	62	40	62	32	71	61
5	82	70	81	70	72	60	57	42	58	41	35	16	38	15	35	27	30	18	56	34	54	46	68	61
6	89	70	85	71	77	58	56	45	53	41	41	25	43	30	40	33	43	14	64	43	60	46	76	56
7	91	71	83	71	81	70	54	36	41	34	36	25	38	19	50	31	54	35	65	44	57	49	73	61
8	92	75	87	68	84	72	52	38	43	34	32	— 3	19	2	48	33	51	23	54	43	61	44	73	66
9	92	76	87	70	88	70	60	30	45	33	2	—15	17	—11	47	31	23	11	49	42	61	40	71	52
10	91	76	84	71	75	66	56	39	50	29	25	— 2	29	15	53	28	34	13	59	40	62	39	70	45
11	90	75	80	71	68	63	49	30	60	36	36	23	44	26	58	34	42	26	63	40	63	42	73	55
12	90	75	85	71	70	57	56	27	63	45	43	30	35	18	50	29	47	35	63	43	69	43	74	55
13	87	73	88	73	65	56	65	33	63	46	47	39	25	11	35	21	41	29	58	39	72	54	83	60
14	85	74	89	71	67	59	59	34	44	37	40	13	31	16	39	26	37	22	60	38	75	57	85	67
15	86	70	84	70	67	50	44	27	40	32	37	6	40	29	50	35	36	17	66	39	75	64	76	70
16	87	71	86	67	68	48	55	26	43	36	37	— 1	39	22	43	33	36	25	77	50	81	63	82	69
17	91	72	80	73	69	48	63	37	48	38	26	8	38	21	38	28	28	19	74	55	82	68	83	61
18	92	76	87	73	73	54	66	35	49	40	22	7	45	23	53	25	33	20	70	56	86	67	89	67
19	93	76	85	72	78	56	65	49	45	29	27	12	42	36	50	30	42	27	65	56	88	66	86	70
20	91	78	77	64	76	60	69	57	48	39	34	12	42	17	42	20	51	25	58	48	86	67	88	68
21	82	67	78	59	74	66	73	53	46	37	40	25	30	10	56	30	39	31	65	39	83	64	80	62
22	85	66	81	59	72	65	64	56	37	29	32	24	31	23	55	38	61	31	74	48	74	56	74	56
23	71	61	88	66	72	63	56	48	35	27	26	15	25	6	47	37	51	37	80	55	68	49	75	56
24	75	57	85	72	71	60	51	42	41	20	20	10	24	17	37	31	37	29	67	51	63	44	81	61
25	78	54	77	61	75	55	48	38	41	32	23	14	34	12	36	28	32	27	65	40	66	42	85	62
26	81	57	75	54	63	51	50	32	40	27	22	17	45	25	47	31	41	24	61	52	68	45	82	66
27	84	65	74	48	60	42	60	30	39	31	21	14	43	25	47	29	46	28	60	54	74	47	81	65
28	84	72	77	52	62	44	64	52	34	21	24	15	50	26	48	27	45	29	66	52	76	48	83	64
29	74	65	80	55	57	42	65	52	35	20	24	15	55	35	.....	.....	52	25	52	40	80	53	86	61
30	81	63	84	67	51	42	73	57	32	18	20	8	57	35	.....	.....	58	33	41	35	81	59	86	70
31	82	61	82	70	.....	.....	75	62	.....	.....	22	— 2	58	46	.....	.....	73	47	.....	.....	83	62	.....	.....
Range	39°		41°		46°		49°		55°		62°		69°		43°		64°		52°		57°		44°	
Monthly means	79°.0		75°.1		64°.6		51°.7		41°.3		22°.6		28°.1		39°.5		35°.5		54°.1		62°.2		71°.7	

Maximum, minimum, and mean temperatures—Continued.

STATION, INDIANOLA, TEX.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	84	73	99	80	86	76	74	57	81	72	45	35	51	30	72	56	64	39	77	66	73	62	86	75
2	85	74	84	71	91	77	74	54	76	51	50	35	52	40	69	60	65	53	71	57	76	61	83	76
3	88	78	86	76	89	75	80	65	68	43	62	47	49	31	71	56	73	56	78	66	79	69	85	71
4	90	79	91	79	93	76	82	69	72	66	52	47	52	37	66	56	65	54	80	64	73	63	88	75
5	86	79	90	78	92	76	85	70	75	61	51	43	57	42	65	53	61	49	77	67	76	59	89	74
6	87	77	89	77	93	78	82	72	75	64	53	44	55	37	62	52	59	48	79	70	73	66	87	78
7	85	75	90	79	92	78	82	70	66	50	57	50	68	46	65	53	72	57	91	70	76	61	90	79
8	88	80	92	78	93	77	76	67	75	47	60	49	61	30	68	52	74	60	82	64	76	63	88	78
9	90	79	92	79	92	77	77	62	75	48	60	44	51	32	61	47	61	37	73	66	76	64	81	63
10	91	78	92	78	93	77	81	65	73	57	75	53	67	31	59	50	64	50	73	61	76	67	77	60
11	90	76	91	78	85	74	85	66	78	61	64	52	74	60	62	52	73	60	71	64	78	69	80	66
12	92	79	95	79	85	71	76	68	80	67	62	50	62	39	65	55	72	64	70	60	79	63	82	66
13	92	78	85	76	85	75	79	69	78	45	75	45	40	33	56	47	72	60	70	55	77	65	80	70
14	92	79	87	77	86	73	81	66	50	39	67	56	49	34	56	45	75	61	74	58	78	70	80	69
15	93	79	89	76	86	70	70	50	45	31	57	48	60	46	56	48	76	62	76	62	82	72	87	74
16	92	78	92	77	81	70	67	55	55	40	58	49	54	33	56	48	76	65	75	66	81	72	84	77
17	90	77	94	78	84	69	79	61	72	50	72	54	45	33	56	48	69	52	76	69	82	72	82	75
18	92	77	93	78	89	72	80	65	67	52	65	37	55	43	56	47	67	56	82	62	82	71	86	76
19	92	76	92	79	83	67	81	66	64	41	50	34	70	49	69	55	72	58	83	62	81	70	88	77
20	85	76	95	79	87	70	85	71	72	52	59	44	67	53	61	52	78	59	83	63	86	69	90	78
21	89	77	95	78	84	68	80	64	72	60	62	52	55	45	55	50	76	62	81	65	85	70	90	78
22	90	78	95	77	85	67	74	50	65	50	62	54	50	43	70	52	75	60	75	68	85	71	92	79
23	95	77	95	77	84	70	80	57	52	36	62	51	51	41	67	48	72	63	86	62	82	71	90	79
24	98	78	93	78	82	71	84	63	54	44	57	34	55	39	61	52	68	45	75	65	89	72	90	81
25	94	78	85	76	80	70	82	66	64	41	36	23	57	45	59	55	68	40	72	62	87	73	88	80
26	95	77	89	75	85	70	81	67	68	46	40	29	55	50	59	52	75	49	81	70	92	73	91	80
27	95	78	84	72	82	74	81	69	72	53	50	37	59	50	58	51	75	58	81	72	80	66	92	80
28	95	79	87	74	80	70	82	70	65	58	53	35	60	51	62	51	75	62	73	58	87	72	94	79
29	97	79	93	74	79	67	84	69	69	55	52	23	60	53	.....	.....	76	65	67	55	87	74	94	78
30	98	80	88	77	75	56	80	70	57	40	51	31	61	54	.....	.....	75	66	70	55	84	75	91	79
31	98	79	90	77	.....	.....	79	70	.....	.....	62	36	65	56	.....	.....	77	68	.....	.....	85	75	.....	.....
Range	25°		28°		37°		35°		50°		52°		44°		27°		41°		36°		33°		34°	
Monthly means	84°.3		83°.3		79°.4		71°.6		59°.0		49°.7		49°.6		57°.0		63°.6		70°.1		75°.3		81°	

Maximum, minimum, and mean temperatures—Continued.

STATION, JACKSONVILLE, FLA.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	94	74	92	74	96	76	71	54	79.5	61	47	29	68	43	72	48	71	(†)	(‡)	53	72	55	81	65
2	92	76	92	73	97	77	65.5	43	82	62	43	25	51	33	74	47	70	.....	.....	57	76	46	82	64
3	97	77	91	75	91	75	74	45	82	64	47	24	53	33	75	51	70	.....	.....	65	81	52	85	63
4	94	74	87	72	88	71	76.5	55	76	58	47	25	53	32	(*)	(*)	77	53	79	64	82	61	89	65
5	91	77	89	75	86	72	83	65.5	72	59	49	25	57	31	75	55	79	57	77	59	87	66	90	71
6	93	76	91	76	88	68	78.5	65	75	61	52	26	65	49	59	51	61	46	81	55	87	67	95	73
7	92	73	92	73	89	73	76	67	76	57	61	38	59	46	60	53	71	41	85	59	80	68	95	73
8	94	73	89	71	92	74	71	61.5	63	44	60	49	66	43	67	52	78	54	77	65	77	64	96	77
9	94	75	91	73	95	76	73	58	59	41	59	41	46.5	40	67	48	73	51	76	64	76	55	94	76
10	96	74	91	74	93	76	75	61	59	39	59	31	57	37	59	44	51	36	64	53	81	55	92	75
11	92	76	91	73	95	75	72	66	62	36	69	32	69	39	66	41	62	38	62	45	76	63	94	72
12	96	73	94	72	92	73	70	52	69	37	66	47	73	51	68	48	74	48	72	48	77	64	83	74
13	98	73	93	73	90	72	65	51	74	45	69	38	79	55	66	50	78	57	74	55	80	64	81	73
14	99	75	92	72	90	72	75	59.5	74	49	62	52	79	60	54	48	75	61	60	48	79	66	84	74
15	100	77	89	72	86	72	78	63	76	51	66	53	77	57	53	44	69	53	67	45	78	66	85	74
16	101	79	94	74	84	70	70	55	75	58	61	43	79	59	58	46	73	48	75	47	77	65	86	72
17	94	75	96	76	86	69	73	54	68	60	70	41	80	58	61	44	78	54	77	51	76	59	87	67
18	88	74	97	75	88	69	74	60	66	57	70	46	79	63	63	39	62	39	81	58	74	70	89	72
19	91	73	98	77	88	68	76	62.5	75	51	59	33	79	60	68	46	72	44	80	65	82	71	95	76
20	93	75	98	79	89	68	74	69	65	40	62	39	76	61	63	45	74	48	84	67	85	72	97	71
21	97	76	93	73	84	73	83	63	67	44	68	46	77	60	62	37	76	57	81	62	91	71	95	75
22	88	76	89	78	86	72	83	62	71	43	71	55	79	64	62	43	65	47	75	58	92	74	93	75
23	94	71	84	73	86	70	76	61	73	47	65	53	66	53	66	(†)	70	45	77	54	96	72	92	75
24	97	77	86	70	90	71	72	52	60	46	61	48	58	43	65	.....	72	48	84	56	83	71	92	74
25	90	74	88	71	90	69	74	50	53	44	52	45	56	35	65	.....	71	56	84	62	85	63	95	74
26	85	73	92	71	90	67	72	50.5	59	39	50	42	64	42	62	.....	(‡)	46	81	64	75	67	97	80
27	88	71	90	76	80	66	71	48	65	41	51	43	68	48	67	.....	.....	49	85	65	74	67	99	80
28	92	73	89	73	81	67	73	53	71	50	58	43	68	43	69	.....	.....	55	84	68	72	66	97	78
29	91	74	84	76	82	66	76	50.5	74	56	61	39	66	41	.....	.....	.....	55	79	67	76	67	90	78
30	86	76	90	72	88	69	76	50.5	65	40	43	24	69	42	.....	.....	.....	51	79	62	77	64	90	75
31	89	76	94	74	.....	.....	77	56	.....	.....	48	28	69	43	.....	.....	.....	51	.....	.....	80	63	.....	.....
Range	30°		28°		31°		40°		46°		47°		49°		.....		.....		.....		48°		36°	
Monthly means	83°.4		82°.6		79°.4		66°.0		59°.1		49°.0		56°.4		55°.6		60°.8		68°.2		72°.8		81°.7	

*No observation. † Minimum thermometer broken. ‡ Maximum thermometer broken.

Maximum, minimum, and mean temperatures—Continued.

STATION, KEOKUK, IOWA.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	75	66	84	64	77	63	55	38	64	55	20	0	16	1	60	40	43	32	62	32	60	43	84	65
2	75	66	85	65	75	51	68	42	56	40	21	0	11	− 2	53	34	35	30	40	22	52	40	86	68
3	90	68	85	67	80	60	58	44	50	36	29	5	18	7	47	31	30	12	45	31	50	40	82	64
4	82	63	82	68	86	67	51	39	50	38	31	12	30	7	39	30	35	8	60	38	64	42	72	62
5	76	66	84	68	71	60	58	44	56	41	39	19	32	19	40	32	30	12	64	36	64	50	75	59
6	88	68	85	69	80	67	56	40	50	33	38	25	35	15	55	31	46	20	64	40	54	50	78	65
7	90	77	84	66	78	69	60	34	42	29	38	27	31	5	47	31	36	21	63	40	52	45	80	66
8	91	75	86	63	86	69	54	37	47	30	30	− 5	15	− 9	47	35	32	12	49	38	63	43	73	60
9	84	72	84	68	85	64	70	42	52	33	8	−10	29	4	47	29	22	5	41	36	70	50	61	45
10	84	67	80	70	67	60	58	38	57	37	37	7	30	24	55	33	42	14	60	41	68	50	75	50
11	86	70	82	71	68	59	50	32	68	38	49	21	31	15	52	30	43	31	58	40	60	49	67	57
12	86	73	88	72	69	57	60	38	68	45	56	31	15	4	33	18	38	31	64	41	63	50	77	54
13	87	73	90	73	67	57	75	45	46	28	46	34	23	2	36	21	40	29	60	40	70	54	72	61
14	87	73	84	69	64	54	54	37	34	26	35	12	30	11	43	21	37	20	62	38	70	58	90	62
15	79	68	84	70	70	49	50	28	38	25	38	10	29	14	45	34	38	20	73	41	76	63	89	70
16	90	73	84	68	72	50	58	34	38	31	13	− 3	14	0	42	27	33	22	74	51	75	64	79	65
17	92	77	86	72	74	51	67	42	38	33	14	5	34	4	45	30	37	18	70	54	84	66	83	68
18	93	73	87	74	80	52	69	45	38	24	19	− 5	34	24	61	36	36	30	78	50	85	69	92	70
19	94	77	85	72	78	58	62	53	37	24	22	13	29	16	47	33	37	25	60	50	84	70	87	69
20	89	74	84	68	68	62	63	55	41	32	27	6	28	8	51	24	33	26	64	47	75	65	88	65
21	84	68	85	69	76	62	62	50	42	23	34	15	32	15	60	32	41	26	65	46	82	62	79	62
22	90	70	91	70	76	62	56	50	40	21	32	13	24	4	49	42	67	36	75	50	71	56	80	66
23	72	60	92	77	80	62	64	42	35	26	18	5	28	− 2	42	29	36	26	76	56	70	50	80	63
24	77	59	96	71	81	66	55	39	42	26	17	5	26	10	33	28	39	21	60	45	70	51	82	64
25	80	60	73	58	72	61	50	34	45	29	26	13	42	12	40	29	35	18	66	45	70	52	80	64
26	82	62	75	57	64	51	55	37	32	28	25	13	42	18	42	24	59	28	68	55	71	54	85	62
27	86	73	78	57	65	44	73	41	43	21	21	5	42	23	45	32	48	31	60	48	75	54	78	66
28	85	67	82	58	67	48	74	58	29	12	19	12	50	29	50	29	48	32	58	39	76	60	84	66
29	80	67	90	67	53	39	76	61	27	20	18	8	50	37	.....	.....	50	29	39	34	84	62	88	70
30	83	65	88	73	48	40	78	62	21	8	18	− 1	57	43	.....	.....	50	39	53	33	85	65	87	76
31	83	66	89	69	.....	.....	67	60	.....	.....	28	16	58	44	.....	.....	72	49	.....	.....	83	68	.....	.....
Range	35°		39°		47°		50°		60°		66°		67°		43°		67°		54°		45°		47°	
Monthly means	76°.5		76°.2		64°.4		52°.2		36°.0		19°.0		22°.5		38°.4		32°.6		51°		62°.3		71°.7	

Maximum, minimum, and mean temperatures—Continued.

STATION, KEY WEST, FLA.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	87.2	80.4	88.6	81.6	92	81	85	78	82	71	60	45	80	63	78	63	82	72	81	69	81	72	83.5	74.5
2	87.7	79.2	88	80.5	90	81	78	72	84	70	56	44	65	53	80	66	80	69	80	69	80	63	83	75
3	88	77.5	88.7	80	91	80	78	65	91	75	56	45	66	49	80	65	76	65	82	70	79	70	84	75
4	85.7	78.3	83	74.8	89	78	85	74	84	69	57	46	66	52	80	69	83	71	90	77	81	72	85	76.5
5	87	76.6	87.3	75	87	79	89	77	86	74	60	45	77	56	81	67	83	71	81	72	86	76	88	77
6	86	77	86.2	75.3	89	78	90	80	83	70	61	49	74	56	77	69	75	69	83	70	88	76	87.5	78.5
7	86.3	78.5	89.2	78.9	89	79	89	76	86	72	71	52	78	62	79	66	76	67	81	73	82	76	87	79
8	90	79	85.6	75.6	92	81	87	80	79	67	75	60	73	60	75	65	84	69	84	75	82	73	87	79
9	88.1	78.8	87.3	76.7	91	80	86	77	78	62	66	57	73	64	76	64	77	67	81	73	79	70	87	79
10	87	78.9	85.6	75.2	91	81	87	77	71	60	69	56	70	59	77	59	78	60	79	70	81.5	69	87	79
11	87.2	79.7	86.8	77	86	77	90	79	70	61	70	62	79	64	73	56	70	60	78	67	81.5	72	86.5	79
12	88.2	80.2	87.5	78.9	89	77	92	78	76	62	71	64	80	64	73	58	74	58	79	66	82	74	86	77.5
13	88	81.3	90	79.6	93	80	87	80	81	62	76	63	86	70	72	62	76	68	79	72	79	75.5	86	79.5
14	83.6	76.9	85	75	91	79	90	77	82	66	62	67	64	70	75	65	80	67	75	67	79	73	85	79
15	86.1	78	87	78.1	89	80	85	76	83	66	81	68	87	69	81	65	74	62	75	63	76.5	68	86	78
16	87.7	80.5	87.6	79	85	74	84	76	79	68	75	66	90	71	77	67	80	58	77	67	75.5	70	87	77.5
17	90.5	80.2	88	79.2	92	79	85	73	84	68	79	64	88	72	68	60	78	68	79	66	80	69.5	88	79
18	86.8	80.4	90.4	78	86	80	81	73	82	69	64	67	83	73	68	55	74	62	80	70	86.5	72	89	80
19	87.5	78.6	88.7	79.7	94	77	79	70	77	70	73	67	82	69	70	55	70	58	88	75	84	75	90	80.5
20	89.2	80.4	87.9	80.9	93	79	86	69	82	68	73	65	86	72	75	62	78	66	89	78	84	76	93	77.5
21	88	75.8	87.8	81	91	80	89	69	76	63	71	61	86	74	69	58	74	67	87	76	86	76	92.5	79
22	91.7	78.9	89.2	80.5	91	80	89	74	77	65	81	65	87	75	73	62	73	60	85	74	89.5	76.5	91	79.5
23	90.1	80.3	91	81.1	93	78	87	68	80	67	88	68	86	74	76	65	80	54	79	71	89	77.5	90	78
24	87.2	80.9	86	79.2	91	80	84	67	79	70	88	68	76	66	67	59	78	64	78	70	89.5	78	93	81
25	88	80	86	74.4	90	80	80	67	78	68	86	72	74	64	65	58	78	66	80	68	87	79	90	81.5
26	88.7	80.5	91	79	87	80	81	68	74	60	87	70	76	62	68	57	73	58	82	71	88.5	77.5	91	81
27	84.4	73	88	81	86	76	80	66	75	59	84	70	76	65	75	60	75	60	83	73	87	77.5	90.5	81
28	84.8	73.7	89	76	86	76	77	68	76	63	85	72	72	59	80	67	78	62	83	74	84	77	92	81
29	84.8	74.8	91	79	90	77	83	69	81	70	78	65	67	58	.....	.....	78	66	83	75	85	77	93	80.5
30	86.5	74.4	90	80	90	76	81	70	77	60	66	56	78	64	.....	.....	78	64	84	75	82	72	90.5	78
31	89	79.9	92	79	.....	.....	84	70	.....	.....	68	52	82	65	.....	.....	80	68	.....	.....	82.5	73	.....	.....
Range	18°.7		17°.6		20°.0		27°		31°		44°		41°		26°		30°		27°		26°.5		18°.5	
Monthly means	82°.3		82°.7		84°.4		79°.4		73°.3		66°.6		71°.1		68°.0		71°.0		75°.9		78°.2		83°.0	

Maximum, minimum, and mean temperatures—Continued.

STATION, KINGSTON, CANADA.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	71.1	54.6	83.6	62.8	79.3	60.5	55.9	38.7	53.4	46.8	9.5	— 0.3	11.6	— 0.3	45.3	33.2	38.8	23.6	47.3	31.5	43.3	37.3	77.8	54.4
2	71.	63.	83.9	61.4	71.5	53.9	54.7	42.0	63.8	46.8	31.5	8.7	16.4	3.8	41.4	29.5	45.7	29.0	42.4	29.6	44.9	31.0	72.0	58.9
3	75.5	62.6	81.2	67.1	69.5	47.0	59.2	49.3	50.8	37.7	29.6	21.8	5.7	— 7.2	41.4	29.5	43.1	28.6	39.1	20.6	49.7	28.7	69.5	50.1
4	68.3	61.5	81.8	69.8	74.1	49.6	59.0	44.8	51.7	35.7	26.0	18.6	5.5	— 8.7	34.3	26.6	41.4	19.5	47.0	22.1	55.3	38.8	68.9	52.8
5	77.5	60.0	84.6	69.0	74.7	44.4	52.9	43.0	49.3	34.2	31.3	14.7	15.5	3.1	32.1	25.2	37.3	11.9	43.4	32.5	55.4	33.2	63.2	52.1
6	73.5	60.7	84.8	70.0	78.5	45.5	57.2	45.8	54.0	36.7	41.9	28.7	30.7	9.7	33.2	27.0	27.7	3.8	49.4	32.7	61.2	38.6	73.5	54.3
7	72.1	58.9	82.8	65.8	75.3	49.3	50.0	38.1	53.1	39.7	37.4	24.6	35.4	20.6	43.1	30.2	29.5	14.7	43.2	28.6	58.5	38.9	73.3	58.8
8	78.2	63.7	82.4	62.2	75.3	58.9	49.2	31.7	48.0	36.0	30.4	17.7	31.6	1.3	34.2	12.3	33.5	14.6	48.6	25.6	57.6	38.7	74.9	60.4
9	84.1	73.0	81.6	63.0	64.1	51.3	56.7	28.5	48.5	34.7	31.4	— 8.4	10.4	— 8.2	34.0	15.7	47.7	14.3	51.8	33.1	53.0	38.5	75.8	64.5
10	84.1	68.0	88.4	64.2	68.3	49.3	61.0	31.7	46.4	32.7	6.4	—14.4	26.0	6.8	33.9	21.7	27.8	9.1	58.1	33.5	52.0	40.7	59.9	50.3
11	80.6	68.0	89.6	68.8	67.2	49.6	53.9	28.8	46.6	33.7	11.6	— 4.4	32.9	9.7	40.4	21.5	33.3	11.5	56.0	36.7	53.2	43.1	63.1	41.1
12	80.5	66.0	87.8	72.5	66.7	47.0	51.0	28.1	48.3	32.2	32.5	9.7	10.4	—21.2	38.3	11.7	34.5	23.5	48.7	35.7	58.1	41.8	76.6	53.2
13	82.4	68.0	87.6	71.8	62.8	46.8	53.4	41.8	49.9	32.5	42.4	31.3	20.3	—16.2	21.9	3.8	31.8	18.3	55.5	29.6	60.9	45.6	76.7	53.4
14	81.6	68.7	87.8	71.5	66.3	48.6	48.4	28.3	43.6	31.5	38.8	28.6	26.4	— 4.7	28.0	4.8	43.4	17.4	57.4	36.0	59.2	43.8	70.8	57.9
15	82.5	66.3	85.4	63.0	66.7	52.3	40.4	24.3	35.2	27.1	37.6	7.8	10.2	— 1.0	36.2	14.7	27.1	15.7	54.2	32.7	63.6	45.0	80.1	56.9
16	80.0	61.2	75.0	54.1	65.3	40.8	49.6	29.3	32.9	26.6	27.9	—10.2	19.6	— 1.5	40.4	23.6	25.1	9.6	61.5	38.7	69.9	49.8	77.3	59.1
17	82.2	61.0	78.2	61.4	61.5	47.0	53.6	33.4	49.6	31.7	1.3	—17.2	23.8	— 5.2	29.5	16.5	22.4	— 3.7	62.5	42.8	68.0	49.8	76.1	54.8
18	85.6	71.8	78.8	61.8	66.3	46.8	55.8	26.6	41.2	34.1	1.5	— 8.2	31.4	15.5	26.1	8.7	17.4	0.6	62.1	39.4	77.9	51.8	75.1	57.5
19	82.0	67.0	79.6	70.0	62.3	56.7	58.5	34.5	48.2	37.6	22.0	— 8.2	36.5	24.5	23.5	6.7	24.5	0.8	48.0	39.3	70.0	61.5	81.1	56.9
20	86.4	66.5	72.0	53.4	62.7	54.7	63.5	39.7	42.7	36.5	3.7	— 8.2	45.0	13.7	30.5	12.7	29.0	8.5	45.7	34.7	76.0	51.8	71.5	50.8
21	76.5	61.6	69.1	45.8	65.3	54.1	64.0	53.1	45.4	33.7	10.6	— 1.2	20.8	9.1	41.6	26.6	38.1	23.6	56.1	33.4	61.7	56.8	65.4	60.3
22	71.3	55.9	77.0	51.1	65.5	54.9	59.2	52.4	49.2	36.4	14.2	3.9	29.8	11.8	44.7	31.4	39.8	29.0	60.2	35.4	65.7	53.8	65.1	53.2
23	70.3	56.4	82.4	57.9	65.5	57.9	63.5	49.8	44.2	30.9	18.4	3.9	25.1	14.7	40.5	31.8	46.4	30.7	61.2	36.5	55.7	38.9	64.6	40.8
24	72.1	53.9	82.1	53.0	70.5	57.1	54.8	44.6	41.1	27.6	12.3	— 5.2	21.9	7.2	41.1	33.4	37.0	27.4	60.8	38.0	58.7	37.9	72.8	54.
25	65.5	45.8	83.4	59.2	69.0	59.4	54.6	37.8	41.1	27.7	10.0	— 5.3	12.4	— 1.1	36.5	29.7	40.4	28.3	57.4	37.5	60.5	37.7	81.9	62.
26	68.8	46.2	73.3	53.9	62.3	47.7	49.4	35.1	33.0	25.3	22.0	— 3.2	32.9	10.1	39.4	28.0	46.4	33.0	56.4	36.7	61.7	46.8	72.9	61.2
27	73.5	51.9	76.2	51.7	56.0	42.4	52.4	30.4	34.0	21.0	28.3	15.1	34.9	14.7	37.9	23.9	46.9	30.7	59.0	38.2	63.8	44.8	76.	57.
28	73.7	63.5	71.1	48.4	57.9	42.0	43.0	28.4	36.0	24.7	33.5	11.7	28.3	5.8	37.5	24.6	36.8	22.0	50.2	39.9	66.8	46.8	76.5	58.5
29	73.6	60.0	77.5	53.9	58.4	45.9	42.4	29.6	30.0	21.7	19.5	11.4	36.9	16.5	.....	.....	37.4	16.4	56.9	45.1	67.0	49.3	70.6	59.5
30	77.0	59.1	79.4	45.4	56.2	39.8	52.0	26.2	25.0	5.8	17.0	7.0	36.2	24.6	.....	.....	41.7	22.0	52.4	39.8	67.8	51.2	74.9	58.5
31	83.2	59.4	79.5	62.6	.....	.....	53.0	31.3	.....	.....	19.6	7.8	39.1	27.4	.....	.....	46.9	30.0	.....	.....	65.4	53.0	.....	.....
Range	40°.6		44°.2		39°.5		41°.4		58°.0		59°.6		66°.2		41°.5		51°.4		41°.9		49°.2		41°.1	
Monthly means	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

Maximum, minimum, and mean temperatures—Continued.

STATION, KINGSTON, JAMAICA.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	84	76	88	79	87	76	88	78	88	77	89	76	82	75	80	72	88	75	85	73	85	77	86	73
2	86	77	86	76	87	77	89	79	89	76	87	74	85	72	83	72	86	75	85	76	86	77	86	79
3	88	79	86	78	87	78	89	77	88	76	78	71	84	73	83	72	84	75	84	73	87	76	85	77
4	86	79	86	78	88	77	87	77	87	76	79	76	86	72	84	72	87	74	86	75	87	76	87	77
5	87	80	86	77	87	77	88	80	87	75	79	74	79	72	83	73	88	75	85	75	86	76	87	77
6	87	78	79	75	83	74	84	81	87	75	87	75	86	73	84	72	85	73	86	76	86	77	87	78
7	.....	.....	87	75	87	76	87	79	88	75	84	74	84	75	84	71	84	74	86	77	86	76	86	77
8	87	77	85	77	88	78	88	77	88	77	86	74	87	74	85	72	86	74	86	76	86	77	87	77
9	87	78	85	77	88	77	84	75	85	75	86	76	86	76	85	73	85	74	85	78	87	78	88	78
10	84	76	.....	.....	86	78	81	76	81	75	88	75	86	75	85	74	84	74	86	75	87	77	85	75
11	86	75	.....	.....	86	77	85	76	81	75	88	74	86	75	86	75	85	74	87	78	87	78	79	76
12	86	77	86	75	87	76	81	78	86	76	88	75	88	73	83	70	87	73	86	79	88	79	83	77
13	86	78	86	77	88	77	85	78	81	75	87	75	87	73	79	69	86	73	85	80	88	78	84	77
14	86	77	.....	.....	89	79	85	75	85	74	86	74	86	72	81	69	85	73	87	81	88	78	85	76
15	86	75	86	76	89	79	89	76	86	75	87	75	86	73	81	71	85	72	88	78	87	70	86	77
16	86	77	85	74	84	78	84	78	80	75	87	76	86	75	85	72	85	74	88	77	84	75	85	77
17	89	79	86	77	86	80	85	79	87	76	88	76	87	71	86	74	84	74	87	76	81	75	81	75
18	86	76	86	76	83	72	83	77	86	75	88	76	88	73	86	74	86	75	87	75	83	74	87	77
19	87	76	85	77	88	78	84	77	68	76	88	76	88	74	85	74	85	74	87	75	81	73	88	79
20	83	76	86	77	87	78	82	76	87	76	87	75	86	72	85	73	86	74	85	76	85	76	87	79
21	84	80	89	78	88	77	86	76	89	77	87	75	88	73	86	74	85	75	85	75	85	75	87	79
22	90	75	87	77	89	78	88	77	78	75	87	74	86	74	86	73	84	74	85	75	84	75	86	78
23	86	77	86	76	88	77	88	77	84	75	87	75	85	75	85	73	83	74	86	76	82	75	88	79
24	87	77	87	76	89	79	88	77	86	75	87	76	87	74	86	73	85	75	86	76	84	77	90	80
25	85	76	87	76	88	77	88	77	82	75	88	72	84	72	82	74	83	76	85	76	85	79	87	79
26	86	76	87	76	89	79	88	77	88	76	88	76	82	72	84	75	84	76	84	74	85	78	89	77
27	86	78	87	76	89	78	88	77	86	76	89	74	85	73	85	74	84	72	84	75	83	78	89	79
28	82	76	88	76	86	76	89	76	86	76	88	75	86	72	85	74	82	70	85	75	85	78	88	78
29	87	77	87	76	85	77	88	77	87	76	88	74	84	72	.....	.....	83	72	86	76	88	72	87	79
30	87	78	87	76	86	78	89	77	89	76	88	75	82	72	.....	.....	82	74	85	76	81	78	88	78
31	87	79	87	76	.....	.....	88	77	.....	.....	77	74	81	72	.....	.....	85	74	.....	.....	85	78	.....	.....
Range	.....		.....		17°		14°		15°		17°		17°		17°		18°		15°		18°		17°	
Monthly means	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, KITTYHAWK, N. C.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	90	75	77	72	91	73	68	53	77	57	32	25	45	26	67	44	51	33	65	44	59	49	77	55
2	93	77	80	71	81	69	61	52	76	59	34	20	31	23	67	46	64	42	61	51	56	42	78	60
3	92	78	88	74	81	68	69	50	76	55	38	27	31	18	55	42	54	47	52	39	59	42	92	66
4	95	78	89	74	83	63	77	57	57	53	37	27	29	18	44	41	69	44	47	41	56	48	83	71
5	94	78	87	76	80	70	71	60	57	52	34	28	38	18	49	41	44	33	54	44	61	50	83	71
6	85	74	87	74	78	68	74	65	68	53	43	28	46	29	43	38	43	34	67	40	55	47	81	59
7	84	74	89	76	85	73	70	60	65	53	50	32	52	37	60	39	60	34	54	44	56	48	81	65
8	93	72	90	75	92	73	61	55	55	50	48	35	55	36	46	39	65	45	50	42	56	48	90	68
9	94	78	92	72	82	73	63	55	53	42	41	15	48	28	41	38	66	37	53	46	53	44	87	68
10	98	77	65	74	79	70	65	61	54	47	29	11	36	29	43	39	40	27	48	41	62	44	87	64
11	97	80	90	71	82	71	64	54	55	43	47	25	44	25	44	37	47	28	48	38	61	49	74	59
12	99	78	89	74	73	68	62	53	57	41	53	39	52	40	60	32	60	35	62	43	56	52	67	63
13	98	77	89	75	78	69	62	58	67	49	58	34	60	40	44	32	68	44	49	45	64	51	69	63
14	100	76	84	71	83	69	75	60	71	52	56	43	42	38	36	30	56	43	47	39	70	54	79	68
15	98	75	90	74	77	70	63	38	64	52	50	34	60	40	43	36	49	35	47	39	79	56	86	67
16	83	73	92	73	73	68	54	35	55	50	51	33	71	45	49	39	56	35	64	37	85	60	89	72
17	88	75	93	77	79	69	64	44	53	49	45	30	45	39	45	37	65	39	72	53	87	62	83	70
18	87	74	85	78	82	69	60	50	57	48	57	27	41	38	48	32	39	29	72	56	89	63	81	66
19	94	76	84	75	82	65	70	52	59	53	40	21	42	38	61	39	59	34	69	59	86	64	90	73
20	97	78	82	74	83	65	67	62	57	38	41	27	67	41	39	31	54	37	76	64	92	64	83	71
21	87	71	80	71	78	70	67	63	52	44	41	33	57	41	55	31	69	45	65	45	91	69	90	72
22	78	68	83	69	73	68	64	57	58	41	55	35	45	35	52	38	54	43	57	49	90	65	82	68
23	90	72	86	69	76	70	74	56	57	44	53	37	39	35	55	42	53	42	60	44	70	60	74	67
24	74	67	83	72	77	66	68	58	48	38	37	29	44	30	55	43	69	42	72	55	66	56	83	67
25	72	63	86	71	71	64	63	49	45	36	43	34	40	22	48	40	56	47	64	53	66	49	93	71
26	82	65	80	72	80	61	60	44	48	35	36	31	48	30	43	37	59	48	57	53	70	58	89	73
27	85	70	77	73	68	56	53	43	59	33	38	34	54	37	40	32	55	44	66	53	68	56	84	72
28	89	72	80	68	72	53	65	43	50	39	42	34	46	35	49	30	57	43	76	62	68	58	75	70
29	89	74	85	65	71	57	63	53	48	40	60	36	59	29	.....	.....	60	41	80	65	63	57	72	67
30	86	75	88	70	80	59	65	59	47	31	36	27	45	36	.....	.....	50	39	73	54	63	58	85	61
31	79	70	90	73	.....	.....	70	58	.....	.....	34	23	47	36	.....	.....	47	43	.....	.....	74	56	.....	.....
Range	37°		28°		39°		42°		47°		49°		53°		37°		42°		43°		50°		38°	
Monthly means	79°.8		78°.3		71°.8		58°.7		51°.3		39°.9		39°.6		42°.6		47°.1		53°.2		59°.8		73°.7	

Maximum, minimum, and mean temperatures—Continued.

STATION, KNOXVILLE, TENN.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min	Max.	Min.
1	87	67	81	60	80	67	48	36	74	48	25	15	29	18	62	34	52	37	65	52	60	38	88	55
2	84	68	86	58	80	64	58	40	68	52	25	12	19	2	54	43	55	44	58	44	66	38	89	58
3	90	70	83	64	81	58	68	33	59	43	27	14	22	—14	56	49	63	36	59	37	70	49	90	62
4	88	70	83	66	85	55	67	47	55	33	34	23	27	12	61	48	62	38	56	43	58	49	90	68
5	83	69	89	70	90	59	74	48	66	42	33	22	33	6	54	41	43	29	66	48	69	53	82	67
6	91	68	87	68	84	63	77	60	57	43	42	15	39	25	52	31	48	25	68	40	72	48	80	62
7	89	69	91	70	85	69	62	44	51	34	42	34	39	32	54	30	59	26	67	51	69	55	87	65
8	91	69	82	68	90	66	66	38	42	33	44	24	37	15	57	30	63	40	59	50	60	49	77	67
9	95	68	87	65	91	65	65	36	43	30	18	6	22	6	60	35	55	21	54	44	65	40	85	67
10	96	73	87	65	87	67	72	35	46	29	24	9	28	6	52	40	37	15	54	40	68	39	70	49
11	95	72	85	67	78	65	61	44	55	26	38	22	44	15	57	30	53	24	67	43	71	42	79	49
12	95	72	85	71	80	58	69	38	65	34	47	32	49	32	62	37	51	31	67	42	75	52	85	55
13	91	69	89	67	84	58	74	40	65	36	58	27	52	38	49	32	59	46	58	41	74	57	86	60
14	90	72	87	68	83	60	72	43	67	43	49	40	39	34	49	37	64	36	64	40	80	55	78	66
15	89	69	90	67	71	57	50	35	69	43	42	26	66	36	52	36	49	26	69	38	80	55	74	66
16	89	70	92	68	73	55	60	25	56	40	39	26	64	42	52	41	73	30	74	42	85	57	74	68
17	89	70	93	67	66	54	66	25	51	46	42	20	46	41	50	30	66	26	74	49	90	59	89	68
18	93	72	91	70	78	53	74	35	55	49	41	15	50	40	54	27	48	23	72	57	94	62	88	68
19	93	72	87	70	84	59	75	34	58	28	34	9	56	48	58	39	70	36	75	51	92	61	88	68
20	93	72	90	73	82	54	76	43	40	28	41	17	60	40	43	26	74	41	62	51	90	65	90	66
21	92	72	88	68	81	64	80	50	52	39	50	26	46	32	55	22	65	40	71	49	85	62	84	68
22	89	70	85	69	75	63	81	59	53	33	50	36	45	32	51	27	60	33	77	45	88	60	79	66
23	89	66	92	71	76	59	63	51	46	34	39	29	37	29	49	35	70	34	82	45	71	55	77	59
24	75	59	96	70	76	63	67	39	42	26	35	29	35	24	44	37	73	43	83	47	72	48	82	64
25	80	54	87	73	80	57	56	39	41	26	34	30	36	19	39	33	61	50	76	61	69	46	92	66
26	85	57	86	69	75	57	61	34	44	29	34	28	44	19	44	32	51	35	72	59	73	46	90	68
27	87	62	86	60	65	46	67	34	50	34	36	29	49	33	59	33	58	35	73	57	78	50	81	67
28	82	68	90	63	72	41	73	41	41	35	38	29	52	27	57	33	56	36	73	58	80	51	86	65
29	89	69	91	67	71	44	75	59	44	38	35	19	57	29	.....	.....	58	39	68	53	81	55	90	66
30	85	67	92	68	56	43	77	53	39	22	22	14	62	37	.....	.....	67	37	60	43	83	53	91	66
31	80	66	89	68	.....	.....	75	50	.....	.....	26	7	57	34	.....	.....	71	39	.....	.....	87	54	.....	.....
Range	42°		38°		50°		56°		52°		52°		60°		40°		59°		46°		56°		43°	
Monthly means	76°.4		76°.2		66°.5		53°.8		43°.9		29°.2		34°.8		43°.7		45°.2		56°.8		63°.8		73°.0	

Maximum, minimum, and mean temperatures—Continued.

STATION, LA CROSSE, WIS.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	72	60	87	66	67	57	57	38	50	42	13	— 2	5	0	45	33	47	35	58	25	52	31	79	63
2	68	60	86	64	71	49	72	42	42	34	15	— 5	4	— 6	38	30	37	24	28	14	57	36	74	57
3	75	65	87	63	78	58	56	41	44	37	21	9	6	— 9	37	29	24	11	42	27	59	41	70	53
4	83	62	87	68	70	57	43	37	48	40	23	11	20	2	38	32	23	16	42	35	66	47	73	53
5	79	66	83	68	62	55	48	29	52	42	37	12	27	18	39	34	22	10	56	32	67	51	74	53
6	88	69	78	69	65	54	48	39	46	35	35	23	30	22	46	33	34	20	49	35	64	49	80	55
7	92	77	83	58	74	59	49	34	35	31	29	11	26	— 3	42	30	20	8	66	42	67	47	76	64
8	93	77	85	61	68	55	45	30	43	33	14	—16	— 2	—14	38	28	15	1	54	39	67	41	68	57
9	84	76	88	64	61	54	72	38	50	29	5	—24	19	— 5	46	22	13	— 5	56	41	67	49	50	44
10	81	64	83	71	58	55	46	33	56	36	12	1	19	3	50	32	27	2	62	40	69	48	61	45
11	86	66	76	62	60	54	50	28	58	43	39	— 1	13	— 4	44	20	34	22	66	39	71	49	58	47
12	91	70	88	60	66	54	60	39	54	36	43	27	3	— 7	30	11	33	24	63	39	74	48	66	46
13	88	74	88	74	60	52	61	38	45	24	42	31	17	—10	38	19	39	21	62	37	76	51	73	50
14	82	67	73	68	63	50	43	30	32	16	33	— 4	24	10	38	20	35	12	67	40	68	54	80	57
15	86	67	78	60	66	48	49	24	41	26	38	— 7	13	2	41	34	30	3	54	45	76	61	76	59
16	86	69	72	63	69	52	61	37	36	31	—4	—20	12	— 9	37	21	28	14	63	43	66	62	77	53
17	86	69	81	65	72	54	65	37	39	33	4	— 6	20	3	39	19	27	— 3	62	52	67	66	85	60
18	88	72	84	71	76	60	66	46	38	28	16	— 9	20	4	53	35	27	5	54	48	79	66	84	67
19	93	71	82	63	76	64	60	56	39	33	16	— 4	20	12	42	32	28	15	65	46	83	70	75	58
20	79	70	75	58	71	64	62	52	41	36	19	7	13	— 4	51	22	33	18	65	40	74	65	76	59
21	84	62	78	55	77	62	56	50	38	26	17	9	24	3	56	37	40	18	68	47	63	57	72	60
22	75	61	84	68	77	58	53	47	28	17	15	8	16	— 2	49	33	38	26	75	52	59	44	78	56
23	72	53	92	74	74	64	55	40	27	20	11	— 5	21	—12	33	21	26	14	66	50	65	48	80	60
24	77	55	87	68	73	49	47	39	34	17	10	—15	18	7	30	22	31	9	58	40	70	44	81	66
25	81	56	71	56	67	56	43	33	32	26	21	10	25	3	37	22	39	11	62	40	73	51	70	57
26	80	62	69	52	58	46	44	30	34	27	19	8	36	8	40	28	41	30	58	50	76	51	72	61
27	80	69	72	50	63	40	59	38	31	18	13	— 9	36	22	42	25	42	34	51	35	78	56	77	58
28	85	61	68	62	57	48	58	41	23	10	16	— 1	43	22	49	24	44	28	35	30	76	56	81	60
29	82	67	72	60	48	41	57	48	20	13	15	— 7	41	17	.....	.....	50	30	33	28	86	61	86	67
30	86	63	82	66	43	37	64	56	17	5	11	— 4	45	36	.....	.....	43	40	44	27	86	70	80	67
31	87	69	80	66	.....	.....	60	50	.....	.....	15	— 6	44	39	.....	.....	58	41	.....	.....	82	65	.....	.....
Range	40°		42°		41°		46°		53°		67°		59°		45°		63°		61°		56°		42°	
Monthly means	74°. 8		72°. 1		59°. 9		47°. 3		33°. 8		10°. 9		13°. 7		34°. 2		26°. 4		48°. 0		63°. 4		66°. 2	

Maximum, minimum, and mean temperatures—Continued.

STATION, LAREDO, TEX.

Day of month.	1876. July.		August.		September.		October.		November.		1877. December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	.....	.....	.....	.....	.....	.....	84	.....	86	.....	52	.....	.....	.....	77	59	69	43	87	71	85	.....	101	80
2	.....	.....	.....	.....	.....	.....	77	.....	66	.....	56	.....	.....	.....	78	64	77	44	73	62	87	.....	100	81
3	.....	.....	.....	.....	.....	.....	91	.....	72	.....	62	.....	.....	.....	77	52	87	54	84	62	100	.....	97	77
4	.....	.....	.....	.....	.....	.....	93	.....	75	.....	56	.....	.....	.....	77	53	63	53	89	60	94	.....	102	78
5	.....	.....	.....	.....	.....	.....	94	.....	82	.....	47	.....	.....	.....	74	45	55	50	92	70	89	.....	103	75
6	.....	.....	.....	.....	.....	.....	92	.....	82	.....	51	.....	.....	.....	71	47	62	48	85	73	89	.....	105	80
7	.....	.....	.....	.....	.....	.....	92	.....	70	.....	(*)	.....	.....	.....	70	55	78	53	97	70	86	.....	104	79
8	.....	.....	.....	.....	.....	.....	90	.....	76	.....	.....	.....	.....	.....	73	49	82	57	91	(†)	88	.....	105	77
9	.....	.....	.....	.....	.....	.....	89	.....	82	.....	.....	.....	.....	.....	72	51	63	51	95	.....	91	.....	92	63
10	.....	.....	.....	.....	.....	.....	89	.....	81	.....	.....	.....	.....	.....	65	48	67	51	71	.....	87	.....	89	59
11	.....	.....	.....	.....	.....	.....	89	.....	85	.....	.....	.....	.....	.....	66	55	82	52	78	.....	94	.....	91	57
12	.....	.....	.....	.....	.....	.....	90	.....	80	.....	.....	.....	.....	.....	67	55	86	66	75	.....	100	.....	89	64
13	.....	.....	.....	.....	.....	.....	89	.....	82	.....	.....	.....	.....	.....	64	40	86	63	79	.....	95	.....	78	68
14	.....	.....	.....	.....	.....	.....	91	.....	49	.....	.....	.....	58	39	63	39	91	64	84	.....	90	.....	90	69
15	.....	.....	.....	.....	.....	.....	61	.....	56	.....	.....	.....	65	40	64	45	92	63	86	.....	95	.....	97	71
16	.....	.....	.....	.....	.....	.....	65	.....	62	.....	.....	.....	46	37	55	50	91	67	94	.....	94	.....	95	76
17	.....	.....	.....	.....	.....	.....	74	.....	77	.....	.....	.....	61	39	57	47	76	60	97	.....	95	.....	98	75
18	.....	.....	.....	.....	.....	.....	80	.....	76	.....	.....	.....	64	39	58	47	92	55	90	.....	95	.....	102	74
19	.....	.....	.....	.....	.....	.....	90	.....	71	.....	.....	.....	75	49	63	49	85	60	91	.....	91	.....	89	77
20	.....	.....	.....	.....	.....	.....	89	.....	78	.....	.....	.....	73	51	61	54	88	58	95	.....	97	.....	99	77
21	.....	.....	.....	.....	.....	.....	89	.....	77	.....	.....	.....	82	47	60	49	88	65	95	.....	97	.....	103	76
22	.....	.....	.....	.....	.....	.....	78	.....	62	.....	.....	.....	51	45	72	46	82	62	96	.....	92	.....	102	76
23	.....	.....	.....	.....	(‡)	.....	84	.....	52	.....	.....	.....	51	41	76	48	82	68	95	.....	94	.....	101	80
24	.....	.....	.....	.....	97	.....	86	.....	61	.....	.....	.....	54	41	67	53	65	47	90	.....	98	.....	102	80
25	.....	.....	.....	.....	94	.....	85	.....	67	.....	.....	.....	58	45	65	57	77	41	95	.....	101	.....	102	81
26	.....	.....	.....	.....	85	.....	85	.....	72	.....	.....	.....	60	47	56	52	85	50	103	.....	99	.....	105	83
27	.....	.....	.....	.....	86	.....	85	.....	82	.....	.....	.....	65	53	51	48	86	57	89	.....	103	.....	104	82
28	.....	.....	.....	.....	82	.....	87	.....	71	.....	.....	.....	68	60	56	47	93	65	80	.....	101	.....	102	80
29	.....	.....	.....	.....	80	.....	86	.....	78	.....	.....	.....	76	59	.....	.....	85	67	77	.....	102	.....	101	80
30	.....	.....	.....	.....	72	.....	87	.....	60	.....	.....	.....	74	57	.....	.....	85	68	78	.....	105	.....	102	81
31	.....	.....	.....	.....	.....	.....	88	.....	.....	.....	.....	.....	76	62	.....	.....	90	67	.....	.....	102	.....	.....	.....
Range	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	39°	.....	52°	.....	.....	.....	.....	.....	48°	.....
Monthly means	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* Maximum therm. broken. † No minimum temp. reported. ‡ Station supplied with maximum therm. and commenced reporting maximum temp. Sept. 21, 1876.

Maximum, minimum, and mean temperatures—Continued.

STATION, LEAVENWORTH, KANS.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	77	67	83	68	78	62	58	35	61	39	21	0	28.5	16	53	39	47	35	63	33	65	44	76	62
2	85	63	86	72	75	54	76	39	43	35	32	11	18	5	61	33	41	31	45	25	61	44	73	61
3	90	69	86	65	85	61	63	45	53	31	31	16	36	12	55	32	36	18	55	36	51	41	75	60
4	90	75	87	68	83	66	50	42	54	44	35	14	38	19	54	31	42	17	60	38	60	39	76	62
5	84	68	89	70	89	72	67	36	59	44	49	23	35	24	49	31	42	24	80	38	61	41	75	57
6	91.5	74	88	72	86	72	64	42	46	33	44	32	37	26	57	29	55	34	70	48	56	50	72	62
7	91	74	89	64	92	74	62	34	45	26	46	31	35	6	51	38	38	18	59	52	58	47	77	60
8	87	76	90	69	91	74	63	43	59	37	36	4	20	— 2	43	35	22	12	55	46	69	47	65	58
9	83	70	87	72	81	61	72	42	58	34	20	2	34	12	50	30	27	7	52	41	70	53	67	45
10	89	66	86	67	63	56	58	40	66	38	48	15	36	17	60	31	47	20	52	41	60	56	73	52
11	92	67	60	63	70	58	55	32	70	46	60	27	34	10	42	29	46	38	62	46	63	55	68	57
12	93	73	91	71	64	56	69	44	59	35	65	31	10	1.5	32	19	46	35	60	46	70	55	78	53
13	91	74	92	75	64	56	70	47	35	23	47	34	27	2	35	23	55	31	64	49	67	59	78	59
14	86	69	87	71	68	49	57	38	31	20	35	14	34	18	42	31	48	27	67	44	73	56	84	64
15	90	70	87	72	71	49	50	29	40	13	48	14	34	— 2	42	36	55	29	75	52	72	63	87	68
16	95	75	83	76	74	51	64	32	43	28	24	3	13	—10	48	29	46	27	69	54	70	63	81	67
17	92	74	86	70	80	57	66	42	46	29	20	5	29	5	60	37	41	18	74	59	80	67	88	68
18	94	74	93	72	80	59	55	49	38	25	25	0	36	12	65	36	56	34	60	53	81	69	93	70
19	93	75	90	68	70	63	69	54	38	23	35	21	30	9	50	34	53	37	56	50	83	65	92	73
20	87	70	83	71	70	59	62	49	55	28	35	16	29	9	52	27	45	37	66	48	75	60	92	74
21	86	65	88	71	69	60	59	41	42	25	44	15	38	16	58	32	62	34	71	51	82	60	83	66
22	95	65	92	74	78	55	55	43	45	24	32	22	29	12	51	37	78	36	78	54	78	60	83	65
23	82	68	91	74	81	59	70	38	52	27	24	8	32	0	37	34	36	22	70	55	73	62	82	63
24	74	59	92	71	86	60	60	41	44	34	20	9	31	11	43	29	32	11	63	45	75	59	84	63
25	80	54	75	60	77	62	59	40	49	29	22	14	42	20	41	26	43	13	60	48	75	58	83	64
26	84	66	76	55	71	52	68	39	47	34	24	7	45	11	40	31	58	34	61	50	73	59	82	64
27	91	73	89	56	70	44	77	53	46	32	24	12	48	24	48	30	55	37	67	52	78	59	85	64
28	90	65	88	66	70	49	77	60	38	24	24	16	54	27	52	32	55	38	49	35	80	62	84	67
29	89	68	90	72	51	39	80	60	35	25	16	— 4	54	39	.....	.....	48	40	50	34	82	67	87	74
30	85	68	93	73	49	37	79	57	25	8	24	— 3	55	47	.....	.....	55	40	58	38	79	71	83	71
31	85	65	92	73	.....	.....	66	51	.....	.....	30	14	60	35	.....	.....	72	54	.....	.....	77	62	.....	.....
Range	41°		38°		55°		51°		62°		69°		70°		46°		71°		55°		44°		48°	
Monthly means	78°.9		78°.2		66°.0		53°.7		37°.6		23°.3		24°.6		39°.5		38°.4		53°.3		63°.8		71°.9	

Maximum, minimum, and mean temperatures—Continued.

STATION, LOUISVILLE, KY.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	89	73	82	63	84	70	51	42	75	58	24	12	27	11	68	49	54	33	68	46	56	40	87	65
2	86	72	88	66	75	59	61	45	67	48	25	9	21	3	62	47	53	41	48	35	58	36	83	71
3	90	70	90	70	78	56	67	47	49	43	31	17	22	9	48	36	55	37	56	34	53	42	80	68
4	90	74	87	70	82	60	58	46	50	36	33	20	31	4	45	35	45	18	62	43	61	37	80	69
5	90	74	85	71	80	64	55	47	61	42	36	21	46	18	42	34	44	29	60	44	56	48	73	65
6	93	69	84	72	82	64	66	46	58	44	45	25	45	31	41	34	51	35	63	46	61	47	76	60
7	94	72	85	73	86	67	54	38	46	35	46	29	41	33	54	30	62	44	64	47	64	51	79	62
8	96	76	86	73	90	73	60	39	45	37	41	5	36	6	52	34	60	26	60	49	62	49	74	69
9	95	76	89	73	91	74	61	34	47	38	13	— 5	22	— 9	49	32	28	20	53	47	63	46	77	54
10	95	77	89	75	82	68	66	44	50	32	34	9	36	13	52	30	40	21	59	46	64	46	73	51
11	95	79	82	73	74	64	51	34	60	38	41	25	48	25	60	33	50	36	64	44	63	47	77	55
12	92	76	86	72	73	62	60	33	68	48	48	34	42	32	50	35	54	45	65	48	64	52	78	60
13	92	73	88	72	78	57	69	39	71	57	58	41	33	20	36	24	47	38	60	45	69	56	85	61
14	89	76	90	73	73	60	64	36	60	43	45	24	36	25	39	28	46	29	63	43	82	57	86	68
15	90	75	89	75	68	55	46	28	46	38	35	12	54	33	49	36	46	24	69	47	83	65	74	69
16	90	72	93	72	70	52	58	30	46	40	33	11	45	27	48	36	47	32	77	53	79	65	87	70
17	96	72	89	76	67	53	66	35	48	41	48	14	40	27	43	33	32	26	69	60	85	66	86	70
18	95	77	91	75	76	57	72	39	50	42	44	12	40	33	56	37	43	28	70	58	88	66	92	73
19	97	78	90	76	80	58	69	47	43	31	34	13	45	35	50	34	65	36	70	56	89	68	90	72
20	97	79	84	71	78	60	74	57	46	39	38	18	48	52	44	25	66	32	56	51	88	72	89	72
21	87	74	81	64	74	66	79	54	52	38	47	35	36	18	57	30	64	37	65	43	86	72	87	73
22	90	66	87	63	78	64	71	57	41	32	45	29	37	29	57	41	63	38	77	50	81	63	75	59
23	80	67	94	70	78	63	57	47	43	30	32	21	35	21	50	40	70	46	82	52	72	58	82	58
24	77	62	93	71	74	63	59	46	49	27	27	19	29	21	41	33	56	42	75	56	66	49	88	69
25	81	58	86	69	78	57	63	37	44	34	28	19	35	19	37	30	42	33	68	51	67	47	92	69
26	85	61	75	57	69	54	57	37	40	31	26	20	49	27	47	33	49	30	61	50	70	55	86	70
27	87	66	78	58	62	47	66	35	45	35	29	18	50	35	50	29	52	34	72	52	74	52	85	73
28	89	69	78	57	71	45	73	53	43	33	28	21	54	31	52	31	52	34	72	57	82	53	88	69
29	81	66	83	59	61	50	66	57	42	29	27	18	60	37	.....	.....	55	30	57	44	83	59	90	68
30	83	66	87	65	52	42	76	57	33	24	20	12	64	41	.....	.....	63	39	52	40	85	61	93	75
31	81	63	85	71	.....	.....	77	59	.....	.....	27	1	66	44	.....	.....	73	54	.....	.....	87	62	.....	.....
Range	39°		38°		49°		51°		51°		63°		75°		44°		57°		48°		59°		49°	
Monthly means	79°.2		77°.6		67°.5		53°.6		44°.0		26°.8		32°.6		41°.2		43°.3		56°.8		64°.1		74°.6	

Maximum, minimum, and mean temperature—Continued.

STATION, LYNCHBURG, VA.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	93	76	74	66	88	72	58	45	79	50	35	21	23	15	66	38	53	28	70	42	55	41	85	56
2	92	76	74	65	81	63	59	42	74	48	32	20	27	13	65	40	51	41	63	49	53	39	90	58
3	92	75	81	67	76	53	56	41	68	50	38	25	23	2	65	46	58	43	54	41	51	41	90	65
4	93	73	86	72	82	56	70	48	58	43	34	24	24	4	52	40	61	49	48	42	64	43	86	68
5	91	74	90	73	81	63	74	55	58	42	39	25	30	— 4	51	39	45	34	63	44	57	48	85	68
6	92	77	91	75	71	61	79	55	58	37	45	24	34	16	58	41	44	30	70	45	57	48	80	65
7	93	75	94	73	84	63	68	48	56	42	48	34	46	33	61	34	60	30	66	47	58	45	83	65
8	96	76	89	73	91	69	60	41	58	40	46	35	40	24	51	33	65	43	54	40	56	49	86	68
9	98	77	87	71	90	72	59	41	52	38	36	8	27	13	48	33	60	25	44	38	57	46	85	69
10	99	77	86	71	75	67	69	41	50	39	23	8	25	10	51	30	38	20	57	39	63	46	78	65
11	100	78	83	71	77	66	60	42	48	35	39	21	42	16	60	27	45	22	64	36	68	41	75	61
12	99	79	80	71	77	64	55	34	64	33	49	31	46	35	65	35	58	35	68	38	60	51	75	59
13	97	79	89	69	74	64	67	35	71	43	58	28	53	38	45	30	62	45	54	37	58	50	80	64
14	97	78	81	70	78	64	76	43	78	47	58	38	44	36	41	24	48	41	53	35	69	54	82	68
15	92	78	87	68	76	63	63	38	65	45	51	28	40	34	49	23	48	32	65	32	80	51	84	70
16	91	78	92	71	68	59	55	32	50	35	44	27	60	34	57	30	62	33	75	38	86	61	79	72
17	90	76	92	72	69	59	67	36	50	45	31	16	50	34	49	32	60	30	74	48	90	63	88	68
18	94	75	89	73	75	57	61	37	56	43	36	19	40	35	51	30	40	23	69	52	92	64	90	62
19	97	77	91	72	79	57	65	35	54	48	41	14	55	35	60	34	58	33	72	56	94	65	92	71
20	98	77	88	72	79	56	60	52	51	42	31	19	61	43	46	27	50	31	69	57	92	67	87	73
21	91	78	76	64	70	62	78	56	60	46	42	20	54	33	61	33	52	38	67	48	90	72	89	74
22	86	74	83	59	65	61	80	51	60	40	39	28	38	32	65	30	59	43	75	43	89	65	82	73
23	90	71	87	67	73	62	66	57	48	35	42	32	39	33	47	41	72	37	78	45	76	64	77	61
24	76	62	87	67	77	62	65	49	45	34	35	21	38	25	49	39	78	42	84	45	68	51	73	66
25	80	55	89	73	76	63	58	43	46	29	31	20	37	28	51	39	66	51	78	56	67	45	89	68
26	85	58	88	74	75	58	53	38	44	34	40	24	52	25	56	36	68	48	64	51	70	49	94	72
27	86	61	81	66	64	50	56	32	46	33	39	31	53	31	51	30	54	42	54	49	74	47	89	73
28	88	64	81	58	66	43	70	34	43	37	33	26	49	31	56	28	54	39	58	51	78	50	79	74
29	85	70	86	61	72	47	65	51	47	34	34	26	64	29	.....	.....	58	38	78	52	78	51	81	67
30	82	67	89	68	64	50	52	48	40	31	31	24	59	35	.....	.....	63	39	65	51	80	51	90	70
31	80	66	87	72	.....	.....	73	50	.....	.....	29	19	61	31	.....	.....	54	34	.....	.....	84	53	.....	.....
Range	43°		36°		48°		48°		54°		50°		66°		43°		58°		53°		55°		36°	
Monthly means	81°.5		76°.6		67°.9		53°.9		47°.3		30°.2		34°.2		43°.6		46°.5		56°.2		63°.1		71°.1	

Maximum, minimum, and mean temperatures—Continued.

*STATION, MALONE, N. Y.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	78	57	77	55	82	64	55	42	53	45	10	— 1	18	— 3	48	39	44	20	60	40	.....	.....	.....	.....
2	78	55	83	58	65	55	54	43	64	44	27	10	14	— 5	39	35	48	30	50	31	.....	.....	.....	.....
3	77	64	84	64	69	50	64	47	62	40	28	18	7	— 5	40	33	50	34	31	20	.....	.....	.....	.....
4	80	60	85	65	65	47	54	42	42	32	27	21	8	— 5	33	20	38	31	50	26	.....	.....	.....	.....
5	83	64	90	64	56	43	54	41	45	29	32	20	21	— 4	35	18	30	15	53	36	.....	.....	.....	.....
6	75	59	92	68	64	44	55	39	50	28	40	25	36	11	42	27	21	9	45	31	.....	.....	.....	.....
7	80	59	85	70	68	48	49	35	50	36	40	26	35	17	40	24	35	17	40	24	.....	.....	.....	.....
8	87	68	85	64	64	53	44	32	47	34	34	18	31	4	25	10	40	16	44	30	.....	.....	.....	.....
9	87	68	87	58	57	47	46	30	44	35	27	—10	12	—12	30	16	54	14	50	35	.....	.....	.....	.....
10	90	73	89	62	63	41	54	40	40	32	— 2	—14	26	12	39	22	25	10	52	35	.....	.....	.....	.....
11	80	67	90	66	66	43	40	30	42	33	10	—10	34	10	45	23	36	18	53	32	.....	.....	.....	.....
12	85	66	91	68	61	42	51	33	42	33	24	15	10	—25	50	16	34	24	42	31	.....	.....	.....	.....
13	86	70	91	69	64	40	50	40	42	34	45	18	17	—15	16	0	27	17	52	28	.....	.....	.....	.....
14	84	67	90	69	64	45	51	29	43	38	45	32	20	—11	27	4	45	19	55	38	.....	.....	.....	.....
15	77	60	85	65	64	51	31	23	35	26	44	7	10	— 4	35	16	38	13	58	33	.....	.....	.....	.....
16	82	58	70	49	58	40	44	26	38	23	32	—19	20	0	42	29	24	12	60	37	.....	.....	.....	.....
17	87	62	76	55	63	46	45	31	41	31	— 4	—19	25	— 2	29	13	16	1	52	40	.....	.....	.....	.....
18	86	71	78	54	71	52	44	32	41	27	4	— 5	30	14	19	10	14	— 4	60	41	.....	.....	.....	.....
19	87	66	80	66	55	49	57	34	50	39	22	— 5	40	21	17	4	23	5	50	37	.....	.....	.....	.....
20	90	56	83	51	56	51	61	42	47	36	2	— 6	48	15	32	14	30	18	40	25	.....	.....	.....	.....
21	78	53	64	37	62	52	64	48	42	32	11	— 4	21	10	42	29	36	30	42	32	.....	.....	.....	.....
22	72	47	72	47	63	55	67	59	50	30	20	4	30	15	48	35	44	33	64	31	.....	.....	.....	.....
23	63	54	73	57	68	52	74	60	43	32	20	9	24	14	46	35	46	34	71	41	.....	.....	.....	.....
24	69	53	75	49	67	56	60	48	34	26	10	2	19	1	40	31	40	29	75	43	.....	.....	.....	.....
25	63	47	83	61	70	51	55	40	34	25	12	— 2	10	— 5	36	22	43	29	58	41	.....	.....	.....	.....
26	69	48	69	54	62	52	46	35	27	21	20	4	35	7	36	25	55	34	60	34	.....	.....	.....	.....
27	71	51	61	52	54	42	40	31	32	18	27	18	37	17	30	14	45	36	60	41	.....	.....	.....	.....
28	75	64	65	49	61	40	37	26	31	26	28	10	34	3	40	12	40	27	60	32	.....	.....	.....	.....
29	70	60	70	42	61	49	38	21	30	21	22	7	34	21	.....	.....	28	19	65	45	.....	.....	.....	.....
30	79	57	73	50	55	41	50	26	25	7	21	11	32	24	.....	.....	41	18	57	47	.....	.....	.....	.....
31	79	60	81	55	.....	.....	55	44	.....	.....	17	7	44	18	.....	.....	47	27	.....	.....	.....	.....	.....	.....
Range	43°		55°		42°		53°		57°		64°		73°		50°		59°		55°		.....	.....	.....	.....
Monthly means	70°. 0		69°. 9		53°. 9		44°. 4		36°. 4		14°. 9		16°. 5		29°. 0		29°. 3		45°. 1		.....	.....	.....	.....

*Station discontinued April 30, 1877.

Maximum, minimum, and mean temperatures—Continued.

STATION, MARQUETTE, MICH.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	58	47	85	58	69	53	50	36	50	44	18	11	26	15	40	36	48	33	55	16	45	26	76	62
2	60	47	90	69	70	48	73	40	44	37	30	18	20	7	41	32	37	18	28	12	57	29	74	54
3	85	55	89	68	72	48	50	35	42	34	30	22	14	3	45	32	25	15	39	18	52	32	57	46
4	72	54	86	65	64	44	43	29	42	35	31	19	20	3	54	32	28	6	44	28	58	31	64	49
5	73	56	82	68	67	39	42	28	45	36	40	24	28	16	40	33	15	9	44	25	59	31	60	50
6	88	61	79	65	57	47	44	34	44	38	35	25	30	20	42	32	26	4	35	21	55	31	72	41
7	84	66	81	58	69	54	42	28	38	29	25	15	26	5	40	28	20	0	56	25	51	32	71	53
8	98	71	89	58	61	49	35	26	45	30	15	— 1	7	— 5	40	28	17	7	47	35	52	36	67	55
9	88	68	91	67	57	53	54	28	45	29	5	—11	13	—15	46	28	20	0	54	31	53	37	55	43
10	76	60	85	69	61	54	39	33	54	34	14	— 3	20	7	50	33	32	2	50	34	55	33	(*)	(*)
11	82	60	72	59	61	48	50	30	58	36	27	5	10	0	44	20	34	10	47	34	56	33	.....	.....
12	74	61	86	53	60	39	54	33	48	33	34	25	10	— 9	24	15	29	15	50	30	72	43	.....	.....
13	72	59	91	66	61	37	42	30	47	24	35	28	20	2	40	16	35	12	54	28	71	52	.....	.....
14	78	57	72	56	62	43	31	27	34	26	30	7	13	—11	38	23	32	10	52	31	74	52	.....	.....
15	80	62	70	54	67	44	47	28	35	24	19	—10.5	10	1	38	27	27	17	59	33	78	56	.....	.....
16	90	63	68	57	74	50	50	33	40	28	— 2	—18	15	— 5	35	19	18	5	54	38	76	56	.....	.....
17	85	66	73	55	76	52	49	34	42	33	13	—12	22	6	30	14	19	— 5	56	31	87	52	.....	.....
18	75	61	79	55	69	46	63	35	44	36	15	2	23	12	38	25	26	10	52	39	79	57	80	50
19	94	61	77	56	76	57	64	46	43	37	18	2	30	14	32	23	32	14	58	39	70	46	65	41
20	69	54	70	44	73	53	55	50	47	39	24	12	27	5	56	23	36	24	55	36	70	45	67	41
21	67	44	83	53	60	55	59	45	47	39	22	15	28	— 5	69	36	35	20	67	35	69	47	69	47
22	65	47	71	60	64	54	57	51	45	23	22	15	15	2	38	23	23	9	75	46	58	38	64	45
23	72	51	88	65	70	52	51	38	30	21	18	10	16	1	23	16	25	5	81	51	57	37	83	71
24	68	54	89	63	76	45	42	36	34	22	25	12	15	0	26	18	30	5	63	34	60	38	83	58
25	71	51	68	54	67	43	38	34	34	27	30	18	28	5	28	18	34	5	63	31	63	44	77	56
26	81	52	70	49	52	43	34	30	28	24	31	24	53	20	34	18	41	15	48	33	63	34	65	53
27	75	61	79	47	59	41	40	31	35	24	33	22	37	28	34	20	38	26	42	32	69	42	72	45
28	78	56	76	61	54	40	45	39	28	23	26	21	48	30	40	22	38	20	40	30	75	47	71	59
29	80	55	75	57	44	36	47	42	26	20	29	20	47	28	.....	.....	47	19	35	29	80	57	66	51
30	78	51	80	62	51	36	60	44	20	12	22	14	43	25	.....	.....	47	28	35	28	90	62	80	49
31	77	52	86	58	.....	.....	56	44	.....	.....	22	10	46	39	.....	.....	45	25	.....	.....	84	63	.....	.....
Range	51°		47°		40°		47°		46°		58°		68°		55°		53°		69°		64°		.....	
Monthly means	66°.9		69°.1		54°.8		40°.2		34°.8		17°.6		17°.3		31°.4		21°.5		39°.6		54°.1		†58°.8	

* Observer sick. † 23 days only.

Maximum, minimum, and mean temperatures—Continued.

STATION, MEMPHIS, TENN.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	93	75	86	.....	92	71	53	45	77	59	30	15	35	20	67	50	58	44	70	54	69	44	90	72
2	83	77	84	67	80	68	64	40	68	47	33	16	30	20	63	53	50	44	54	41	72	48	85	70
3	93	75	84	65	80	64	72	48	55	40	33	17	34	6	58	48	69	40	51	40	76	57	88	73
4	96	76	85	67	88	65	61	49	59	41	36	20	42	15	53	42	48	29	60	45	61	50	88	72
5	92	76	86	68	87	67	58	47	67	46	41	21	46	31	58	37	43	30	74	47	68	52	81	65
6	93	74	86	71.5	92	73	73	56	68	48	52	29	41	36	57	37	54	31	72	61	74	58	89	66
7	95	76	87	73	91	74	60	45	53	38	53	41	46	36	58	38	62	42	63	57	65	53	85	67
8	92	76	87	71	91	73	66	42	47	33	53	29	42	15	58	36	62	29	63	51	63	51	76	69
9	89	72	83	69	91	72	63	43	56	36	30	12	26	7	58	41	33	23	52	47	71	54	72	59
10	90	73	80	69	79	64	72	49	55	33	44	17	45	25	59	37	42	23	54	45	71	55	74	55
11	95	76	88	71	72	61	58	41	68	41	52	27	59	42	60	37	56	37	60	48	80	58	80	57
12	95	76	90	75	75	61	63	38	71	51	61	36	63	39	62	47	60	50	57	49	80	64	81	64
13	90	74	87	74	80	57	73	46	71	56	69	45	39	29	48	35	58	42	67	48	81	63	85	65
14	92	74	88	71	75	63	71	49	62	40	59	42	45	32	40	34	60	40	70	49	86	65	80	71
15	90	74	92	75.5	71	57	52	35	41	36	45	23	62	45	50	36	49	30	77	51	84	68	77	69
16	91	76	94	77	74	56	62	31	46	38	37	28	49	30	49	44	77	45	78	60	86	69	86	70
17	95	78	94	78	76	54	71	37	50	42	56	25	39	31	58	31	46	33	72	61	86	69	90	74
18	94	79	94	76	78	52	77	53	50	43	47	16	45	26	63	38	63	33	72	60	88	67	90	73
19	95	80	94	79	83	56	77	56	43	29	37	16	52	40	63	42	70	51	63	56	89	66	90	73
20	94	79	89	76	78	66	76	62	53	29	46	23	57	35	45	31	71	55	65	52	89	73	90	75
21	92	73	91	75	68	62	76	56	61	42	53	34	35	26	57	30	60	43	66	48	90	72	86	76
22	93	72	92	74	76	64	62	56	50	35	50	40	44	31	47	42	70	40	80	57	92	67	82	73
23	91	(*)	92	74	81	62	66	46	54	41	40	27	40	28	49	40	75	52	80	62	81	68	86	66
24	80	.....	92	77	84	65	68	50	58	35	33	25	40	29	46	37	64	33	68	61	76	61	87	73
25	81	.....	89	77	87	69	65	45	51	38	33	22	41	27	44	34	42	30	64	59	75	56	93	76
26	86	.....	82	69	77	64	73	48	58	37	26	20	48	37	40	30	63	34	71	61	74	55	87	72
27	87	.....	82	64	68	50	78	56	59	45	28	20	54	34	54	31	65	43	70	61	79	55	80	68
28	92	.....	85	64	72	47	78	63	53	44	28	24	60	33	59	32	59	44	62	51	86	59	89	70
29	92	.....	89	68	63	54	78	65	52	39	28	14	61	35	.....	.....	56	44	60	46	86	65	93	73
30	87	.....	92	73	58	47	79	61	41	25	19	3	68	41	.....	.....	72	48	61	44	86	65	94	77
31	85	.....	92	77	.....	.....	78	59	.....	.....	23	10	68	53	.....	.....	79	61	.....	.....	89	65	.....	.....
Range	.....	.....	.....	.....	45°		48°		52°		59°		62°		37°		56°		40°		48°		39°	
Monthly means	81°.3		79°.1		70°.0		58°.5		48°.1		32°.6		39°.3		46°.7		50°.0		59°.3		70°.5		77°.8	

*Minimum thermometer broken.

Maximum, minimum, and mean temperatures—Continued.

STATION, MILWAUKEE, WIS.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	62	56	77	58	72	58	53	38	50	47	18	11	15	7	45	36	39	27	55	32	40	31	73	54
2	76	57	79	62	70	50	68	41	47	34	26	11	15	2	41	31	35	23	32	21	43	30	81	55
3	81	60	73	64	75	55	58	42	42	29	26	21	13	— 2	38	32	25	13	36	24	52	31	75	56
4	78	63	81	67	68	55	44	34	45	33	26	17	18	— 6	35	30	25	4	51	35	53	35	62	46
5	80	61	75	67	61	54	50	26	48	36	30	10	24	17	36	29	19	7	45	28	55	37	62	46
6	75	61	83	67	65	57	47	38	47	32	35	24	27	17	47	31	35	3	41	31	49	39	61	48
7	91	63	75	62	63	58	56	30	37	33	25	11	20	— 1	40	30	26	9	45	30	50	41	78	49
8	87	65	76	60	63	58	42	30	39	31	11	—10	— 1	— 9	42	25	28	14	40	35	52	40	70	50
9	89	64	76	62	61	55	65	28	42	30	— 3	—19	13	—11	35	26	14	5	40	35	50	38	57	47
10	73	60	66	65	60	57	62	32	51	32	11	— 8	25	11	49	30	19	— 3	48	35	48	38	61	44
11	73	59	70	62	60	56	42	27	52	35	30	— 4	21	4	49	32	30	11	50	36	50	34	61	45
12	74	60	74	67	63	54	54	31	54	41	41	23	12	— 1	32	18	30	22	50	34	55	39	68	47
13	80	61	74	68	60	55	51	35	54	32	41	30	13	—10	30	21	35	19	44	35	63	44	60	48
14	75	66	81	64	61	52	44	28	36	29	30	— 2	23	11	31	25	31	13	45	32	56	44	65	51
15	75	66	67	61	63	47	43	23	37	30	29	— 5	25	9	37	27	25	2	46	34	78	45	84	50
16	74	61	72	60	64	46	57	31	35	27	3	—17	12	1	35	23	25	13	68	42	82	57	60	49
17	87	62	71	60	65	50	52	40	38	33	15	— 5	21	— 5	31	14	26	5	46	39	80	63	70	52
18	81	62	85	66	69	50	54	36	41	37	10	— 2	26	12	57	26	23	11	45	39	77	56	80	55
19	89	63	84	61	77	58	56	49	41	37	10	3	24	17	33	26	25	17	42	38	73	52	71	46
20	81	64	67	60	70	61	61	49	44	39	24	6	17	0	48	21	27	12	54	39	71	54	70	47
21	72	62	68	58	68	62	59	49	43	30	22	9	21	— 4	36	34	37	21	51	39	73	56	67	48
22	77	55	82	64	74	61	•54	48	31	26	19	9	19	— 2	44	31	50	32	62	42	61	45	58	49
23	65	50	93	73	68	62	52	45	27	22	13	1	16	—11	33	23	23	16	77	42	50	43	65	45
24	69	51	85	73	69	62	47	38	31	18	24	7	17	7	29	23	25	18	60	43	49	41	81	55
25	80	58	76	58	68	62	40	35	31	25	25	20	25	1	33	24	29	13	49	36	52	41	73	54
26	71	61	72	52	63	43	43	31	29	26	23	7	34	12	34	28	39	18	55	37	57	41	74	52
27	82	62	73	48	59	40	49	32	33	23	15	1	36	23	34	28	44	29	41	35	60	42	70	56
28	77	62	73	55	62	45	50	46	26	18	18	5	46	19	36	29	35	27	39	33	62	45	76	60
29	75	64	73	62	52	38	48	46	26	14	23	13	45	27	.....	.....	35	22	35	30	68	53	83	65
30	75	60	80	66	46	32	71	47	23	14	19	5	41	35	.....	.....	38	29	36	29	80	56	82	61
31	77	60	85	65	.....	.....	62	49	.....	.....	18	— 2	45	39	.....	.....	46	34	.....	.....	73	49	.....	.....
Range	41°		45°		43°		48°		40°		66°		57°		43°		53°		56°		52°		40°	
Monthly means	70°.3		69°.7		58°.5		44°.9		34°.9		14°.2		15°.4		31°.4		23°.5		40°.7		59°.8		60°.4	

Maximum, minimum, and mean temperature—Continued.

STATION, MOBILE, ALA.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	94	78	89	79	92	76	64	51	79	56	39	27	37	32	71	49	64	56	74	63	76	51	87	65
2	93	82	91	71	90	76	65	43	75	65	43	29	46	27	69	51	65	54	76	62	81	54	87	66
3	90	76	87	73	90	74	71	44	66	53	44	26	45	30	67	59	70	49	65	56	78	56	89	69
4	94	78	79	72	91	74	73	47	69	47	45	26	46	30	66	54	72	57	78	58	71	63	86	68
5	87	77	83	73	92	73	77	56	71	54	44	27	50	35	56	50	62	41	74	56	81	61	90	75
6	88	77	84	76	92	78	82	63	75	57	47	28	51	44	64	43	61	36	75	61	81	66	93	77
7	88	76	86	74	92	73	72	59	64	46	54	30	49	44	70	47	66	37	75	64	82	66	91	78
8	90	75	83	74	87	75	72	50	57	38	59	45	54	28	66	50	70	60	77	57	74	57	87	81
9	94	78	90	74	91	75	69	56	56	38	48	37	39	19	67	47	63	40	72	57	77	51	88	76
10	94	76	86	77	91	75	78	56	59	36	56	34	52	26	63	44	53	33	71	52	80	55	78	66
11	96	76	90	77	90	71	77	56	64	36	65	52	63	43	65	40	62	36	71	55	82	58	83	62
12	90	80	85	77	82	68	78	51	70	45	66	44	69	58	68	50	68	51	63	53	83	65	87	66
13	93	75	91	75	87	65	73	56	74	55	64	40	65	57	65	53	64	59	60	51	85	67	86	72
14	94	76	90	72	87	66	75	54	75	59	66	52	65	54	53	45	75	59	72	49	84	66	81	76
15	(*)	77	88	72	80	66	68	55	63	49	60	42	66	58	48	42	67	52	74	52	86	67	88	73
16	.....	74	89	71	78	57	71	47	61	47	58	33	68	53	51	43	69	50	75	56	84	65	89	76
17	.....	79	89	75	83	60	75	53	70	54	63	34	68	52	57	41	66	41	74	60	86	63	89	77
18	.....	77	89	75	84	64	77	55	71	58	57	31	70	62	61	36	64	35	72	65	85	63	89	74
19	.....	77	89	75	85	65	71	59	58	42	48	23	68	57	66	45	66	44	82	64	85	72	91	77
20	.....	79	92	77	85	69	78	67	55	35	55	29	68	60	61	43	71	51	78	60	85	72	88	76
21	.....	79	95	75	87	73	80	70	63	38	60	45	62	55	55	35	73	57	79	56	87	69	90	77
22	.....	76	91	75	86	67	81	59	68	50	65	56	55	50	59	43	70	45	83	57	93	75	95	78
23	.....	76	89	78	87	70	69	51	54	45	59	43	53	41	65	43	70	47	76	61	94	70	94	75
24	94	80	94	76	89	68	72	48	53	43	53	43	52	35	61	42	69	57	76	58	84	69	94	80
25	91	76	93	74	90	71	74	55	58	41	48	38	50	32	60	42	64	41	77	62	83	63	94	77
26	90	75	93	74	91	72	74	51	58	38	39	35	57	42	59	42	68	40	79	67	84	64	95	77
27	89	78	93	74	79	64	79	57	69	47	46	36	62	42	66	38	76	49	79	67	81	62	97	79
28	89	76	92	74	83	55	77	60	74	55	54	42	62	38	72	45	75	57	23	63	84	65	100	80
29	86	75	93	76	82	64	76	55	78	55	47	27	64	39	.....	.....	72	53	73	57	82	66	97	77
30	90	75	93	73	72	57	76	53	55	35	37	21	63	40	.....	.....	74	51	73	56	84	67	97	82
31	90	75	92	78	.....	.....	78	54	.....	.....	46	27	68	42	.....	.....	76	58	.....	.....	84	66	.....	.....
Range	.....		24°		37°		39°		44°		45°		51°		37°		43°		34°		43°		38°	
Monthly means	83°.3		80°.1		76°.8		64°.4		55°.7		44°.4		50°.1		53°.4		57°.5		65°.9		72°.8		82°.8	

* Maximum thermometer broken.

Maximum, minimum, and mean temperatures—Continued.

STATION, MONTGOMERY, ALA.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	93	71	87	70	93.5	77	56.5	46	78.5	53	35.5	27	41.5	31	68	49.5	59	52.5	77.5	60.5	70.5	48.5	89	62.5
2	92	76	86	68.5	89	72	63.5	42.5	71	60	38	20	43	26.5	68.5	47.5	61	53	74	60.5	74.5	51	92	63.5
3	94	76	83	70	90	67	71	41.5	65	51.5	40.5	22	41	23	64.5	57	71.5	41	70.5	49.5	78	53	93	69
4	91	74	83.5	72	90.5	67.5	75.5	46.5	67.5	43	40.5	24.5	46	26	68	55	71	55	62	52	70	59	90	70
5	93	71	81	72	91	69	75	50.5	72	50	41.5	25.5	43	30	57	50	55.5	38	76	47.0	80.5	63	92	70
6	93	72	86.5	73	93.5	75	82	60	74	55	49	25.5	44.5	38.5	64	41.5	54	32.5	78	53.5	82.5	62.5	93	74.5
7	95	74	91	70	92.5	72	71	57	60.5	45	54	37	47.5	40	64.5	46	66	35	77.5	56	76	63	94	71.5
8	95	75	89.5	72.5	95	71	72	50	51	36	53	43	47	24	66	43.5	67.5	53	75	58.5	67	44	90	75
9	95	76	90	72	91	76	69	53.5	53.5	35	46.5	31	38.5	16	65	43.5	69.5	34	62	52	74	49	93	75
10	97	74	87	71	92	74	79	55	53	33.5	59	27.5	54	26	61.5	45	49	28.5	61	46.5	76.5	52.5	80.5	64
11	100.5	75	90.5	72	89.5	71	76	56	63	32.5	60	47	62	33.5	65.5	40	59	32	65	51	79	53	86	58
12	96.5	71.5	92.5	75	81	67.5	69	53	70	37.5	61	43	68.5	53	65.5	48	68	44	61	51	84	62.5	86.5	65.5
13	95	74	90.5	75	84	63	74	54.5	70.5	44	64	36	70	59	65	46.5	63	58	59	51.5	81	64.5	89	71.5
14	94.5	77	89	73	87	66.5	72	62	74	55	64.5	46	60.5	52	46.5	37.5	66	56.5	71	48.5	84	66	79	73.5
15	96	77	90	71.5	79	64	65	52	67.5	47.5	53	39	70	59.5	43	35.5	60	40	75	50	83	65.5	88	71.5
16	96.5	75.5	91.5	72	80.5	56	66.5	42	60.5	43	55	32	69	55	55	41	76	43	78	53.5	85	64	93	74
17	96.5	75	92	74	82	64	71	42.5	63	53	61	32	71	54.5	53	38.5	63	35.5	76	56	85.5	63	92.5	73.5
18	94.5	78	92	74	83	59	76	45	66	57.5	50	28.5	71	64	63	39	56.5	31	70.5	60	85	61.5	90	75
19	96.5	77	95	75	84.5	61	66	56	59	36	46.5	21.5	66	61	68	43.5	70.5	41.5	81.5	64	87	73	93.5	75
20	96.5	76	95	74	84	64.5	73	61	57.5	33	52.5	23	74	59	54.5	41	74	49.5	73	58.5	88.5	71.5	91	75.5
21	93	78.5	95	75.5	84	72.5	86	62	64.5	37	57	42	60	53	59.5	32	68	50	80	54.5	91.5	72	93	75.5
22	96	75.5	93	76	81	65.5	82.5	61.5	65	47	69.5	52.5	59	50	58	40	65.5	41.5	81	57	94.5	70	93	74
23	96.5	75.5	94	77	84	66	64.5	55.5	53.5	41	53	42	54	41	58.5	45	72	42.5	80	57	92	67.5	87	74
24	95.5	74	92	77	87.5	65.5	74	47.5	51	38	43	39	50	33	56.5	39.5	71	48.5	78	53	84.5	63.5	93	73.5
25	79.5	71	95	73	89	68	71.5	51	55	37	41.5	38.5	47.5	30	54.5	37	63.5	36.5	82	62	83	59	95	75.5
26	82	68.5	92.5	74	90	68	73.5	48.5	59	36.5	41	37.5	55.5	40	56.5	33.5	62.5	37	79	64.5	82	57	95	76
27	90	72	93	75	76	59	76	51	68	44	47	34	59	45	65	42	75.5	45	81.5	64	82	62	94.5	77
28	93	75	94	73	79	51.5	75.5	54	60	52.5	45	40	62.5	37	68.5	43	72.5	50.5	80	63	81.5	59	96.5	75.5
29	88.5	75	92	75	81	56.5	76.5	54	58	49.5	45	25.5	63.5	37.5	.....	.....	68.5	47	74	57	81	63	96.5	74.5
30	89	70.5	94	75	67	53.5	76.5	54	49.5	33	34.5	22	66.5	40	.....	.....	72	48.5	69	55	84	60	100.5	76.5
31	87.5	71.5	94.5	76.5	.....	.....	77.5	53	.....	.....	43	22	66.5	42	.....	.....	77.5	55	.....	.....	87	60	.....	.....
Range	32°		26°.5		43°.5		44°.5		46°		49°.5		58°		36°.5		49°		35°.5		50°.5		49°.5	
Monthly means	82°.8		80°.9		75°.1		62°.9		53°.2		41°.8		49°.5		52°.3		55°.3		64°.4		72°.0		80°.8	

Maximum, minimum, and mean temperatures—Continued.

STATION, MONTREAL, CANADA.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	75.3	60.5	76.8	60.6	81.7	66.5	53.5	40.8	47.8	43.8	9.1	2	12	4	39.1	27.8	32.7	22.3	46.9	36.5	49.3	41.3	83.5	63
2	69.3	64.4	83.3	62.3	68	53.8	49.6	43.3	44	42.5	30.2	7.8	14.8	6.3	37.7	34.4	37.8	17.4	48.1	32.5	44.7	35.5	85	63.4
3	78.5	68	82.2	63.6	71.7	50.3	62.6	44.4	54	36.6	31	26.2	6.7	— 3.9	39	31.5	40.1	30.3	36	19	46.2	32.2	79	63.1
4	77	66.3	84	67.7	63.2	53.8	53.5	45.5	45.4	32.5	27.8	20	4	— 4.8	33.2	24.2	35.8	18.6	43	20.6	54.5	36.6	67.8	56
5	77.9	64.1	80.2	70.6	59.4	47.7	48.4	39.3	41.5	32.6	26.8	15.6	10.2	— 2.4	33.7	24.6	25	16.5	44.4	28.3	56.2	39.4	65.5	51.8
6	76.8	62.8	92.2	73.7	65.1	48.5	55.4	37.9	44.8	32.7	33.4	24.8	14	3.5	37.3	26.4	20	9.3	47	33.2	61.3	38.2	70.2	54.4
7	76.8	64.7	87	72.4	64.5	49	50	37.7	45.3	34.3	35.3	26.4	30	12	36.7	27.2	27.1	13.5	43	27	57.7	38.5	75.7	55.5
8	84.1	66.6	84	67.2	58.7	50.7	45.2	31.2	41.3	34.2	26.4	7.9	27.2	4	28	13.1	24	12.9	47.6	29	51.7	38.2	74.8	60.9
9	79.2	64.6	86	63.6	61.1	50.7	43.3	31	40	36.7	23.2	— 4.7	4.8	—13	32	13.5	44.6	15.7	55.1	32.1	50	36.3	79.7	62.9
10	87.6	71.6	89	65.7	66.2	48.7	53.8	40.7	41	34.6	— 3.8	—11.3	18.1	—11.4	37	13.7	22	13.2	55.7	35.6	51.2	39.3	72.1	53.2
11	80.2	68.5	88.4	67.9	70.2	48.8	44	32.8	41.6	36.5	1	—11.2	27.2	12.9	38.2	18.5	30	12.9	56.4	34.6	63.3	39	65.3	50.9
12	85.8	66.3	87.8	69.3	64.8	49	49	27.9	44.4	36.6	17	0.5	12.9	—20.9	39.3	16.3	29.8	16.5	49.4	30.4	66	41.6	76.2	53.5
13	86.5	71	91	72	67.8	49	50	35.1	43.2	35.5	38	16.6	15.8	—15.2	23.8	2.1	28.3	12	55.7	30	72.5	50.4	76.2	55.3
14	84	66.4	90.6	71.4	62.8	47.2	41.7	29.7	42.8	31	35	25.5	18	— 7.5	21.1	5.2	37	7	58.1	35.3	75.4	49.3	74.9	63.1
15	77.8	65.4	84.7	61.1	62.8	52.4	35	27.4	32.9	27.1	37.3	8	— 1.7	—18.3	31.8	14.6	32.5	14.3	61	36.8	75	55	78.4	63.5
16	84.6	65.8	69.8	55.5	75.3	42.8	40.6	27	36.5	25.4	23.2	—18.5	14.1	— 2.1	37.8	28.9	23	9.4	63	40	76.7	54.8	73.8	64.6
17	85.6	68.3	76.7	56	60.6	43.9	40	31.3	37	28.6	— 7.5	—21.8	17	— 5.6	31.9	12.7	12.8	— 4	57	38	76.5	61	74.8	58.6
18	86.8	74.6	77.9	59.2	59.8	49.9	45.3	31.2	37.2	29.4	2	— 9.9	27	9.6	24	11.3	17.8	— 7.7	56.9	36	77	66.7	78.8	59.2
19	85.9	67.7	69.2	64.8	54.3	50.5	55.8	31	45.2	33.2	?	—10.9	28.1	17.1	21	5.6	26	6	45.8	33.5	75.5	62.2	78.4	55
20	87	67.8	67	51.5	57	51.8	59	37.2	39	33.2	0.2	—10.7	15.8	5.2	25.2	13.7	34.1	12.6	39	33	72.3	59.3	66.6	50
21	72	61.2	66	48.4	60.2	49.7	48.1	41.5	38.7	30	2	— 6.7	15.8	5.8	39	25	30	24	41.6	32	69.1	47.9	63.7	55.5
22	69.6	55.9	75.4	55.4	61.2	54.2	62.6	47.5	39	27.8	13.5	— 0.8	27.6	10.5	48.2	28.7	41.7	28.4	65	38.5	66	52.1	62	51.9
23	67.4	55.6	70	56.9	67	54	67.8	55.6	39.8	35.5	18.8	8	22.2	13	39	25.7	35.3	28.2	73	51	54	44.3	70	49.1
24	73.2	53.6	76.4	53.3	67	53.6	62.8	46.8	35.6	26.2	9.5	2.7	18.9	0	36.8	29.6	38.2	26.1	74.3	50	54	42.4	62.2	57.8
25	70.3	49.9	82.3	59.7	68.5	54.8	48.8	42.2	29.5	24.2	15	3	4	—10.6	35.3	29.4	29.7	23	61.4	45.2	57.4	44.5	76.7	56.8
26	68.9	51.6	70	55.5	60.9	51.1	43.4	35	25.3	19.5	12.2	0.5	21	— 1	40.9	28.8	45	23.5	66	39	61.7	48.3	67	53.6
27	73	55.3	60.7	51.5	51.3	41.3	42.2	31.4	30.5	19.2	22.8	11.6	25	9.3	34.4	18.2	37.9	34.1	61.3	41.3	65.7	46.8	70.3	52.8
28	74	61.6	66.4	48.8	60.3	40.5	37.8	27	30	22.8	24.5	13	14.7	1.2	36.5	13	38.7	31	53.4	34	76.3	55	73.6	56
29	73.2	63	73	54.6	54	46.7	40.8	24.7	30.4	18	15.5	5.4	23.9	10.1	.....	.....	31	25.8	61.2	43.5	78.2	58.2	75.8	59.7
30	78	62.3	78.9	53.7	56	44.9	43.7	29	18.8	7.7	21.2	11	29.7	17.1	.....	.....	46	24.2	54.2	45.3	79	58.7	75	59.9
31	80.3	64.1	78.8	53.9	.....	.....	47.3	37.3	.....	.....	11.8	8.4	30.4	25.4	.....	.....	46	30.6	.....	.....	72.7	61	.....	.....
Range	37°.7		43°.8		41°.2		43°.1		46°.3		.....		51°.3		46°.1		53°.7		55°.3		46°.8		35°.9	
Monthly means	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, MORGANTOWN, W. VA.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	89	68	76	64	80	70	51	45	74	48	23	15	20	10	63	46	55	22	69	52	46	36	67	54
2	89	69	74	65	70	54	53	40	74	51	22	16	20	11	55	47	59	43	61	33	46	36	84	57
3	84	69	86	60	70	47	65	42	61	45	26	21	17	9	48	36	51	37	46	26	52	31	81	64
4	87	69	89	66	75	52	52	43	50	40	28	22	19	9	49	31	52	28	61	38	59	33	81	61
5	85	68	90	68	65	52	53	41	57	37	31	23	38	8	45	36	36	26	51	44	60	35	84	61
6	82	67	88	70	68	50	61	51	57	42	33	17	36	19	42	35	38	19	54	44	55	46	68	58
7	86	70	86	71	78	64	51	38	49	36	39	28	36	32	40	33	52	35	57	34	64	39	71	58
8	92	69	84	68	81	70	53	35	43	38	35	23	37	12	42	29	59	35	52	40	52	46	83	56
9	94	74	85	60	72	60	54	30	43	36	23	— 1	20	6	43	22	56	18	54	38	52	37	82	67
10	95	73	87	64	73	61	63	38	42	36	17	— 4	29	1	51	24	27	12	58	38	55	36	72	56
11	92	72	84	68	74	62	46	33	39	34	33	17	46	26	54	26	41	18	60	38	64	38	75	46
12	89	69	83	67	70	62	56	25	56	28	36	32	46	30	49	21	45	35	58	32	65	38	80	56
13	84	69	84	69	73	59	63	31	63	43	52	34	44	18	30	15	44	35	53	32	72	38	82	56
14	86	71	84	65	74	60	63	34	59	46	47	37	31	23	47	16	50	29	55	31	76	48	84	60
15	82	68	87	65	64	56	36	30	48	40	37	17	51	32	47	23	35	22	60	31	82	49	80	64
16	85	59	84	70	68	49	47	25	45	36	32	11	51	32	46	30	34	26	71	33	81	60	80	66
17	90	67	82	68	60	55	57	37	50	29	30	5	35	28	35	25	26	13	71	52	84	64	82	68
18	91	76	85	70	64	55	61	27	57	42	38	13	45	25	41	20	30	1	60	55	87	60	87	66
19	93	75	86	73	71	58	72	31	52	45	24	11	42	35	46	30	30	14	73	53	90	60	85	70
20	90	72	76	61	75	51	75	47	46	42	26	5	51	28	37	20	46	15	58	44	89	65	86	66
21	78	65	73	51	77	57	76	56	45	42	40	19	35	18	53	28	55	35	59	37	83	66	86	70
22	83	58	79	49	66	60	82	50	48	36	34	24	36	26	61	31	53	33	68	36	78	60	71	55
23	70	58	80	62	73	60	72	53	38	32	31	15	34	23	50	36	66	32	73	39	63	50	78	47
24	71	55	88	67	65	60	58	44	34	25	21	15	25	18	40	36	57	38	78	41	54	41	81	63
25	74	56	84	71	70	60	46	38	38	31	32	21	29	14	38	34	65	44	62	45	55	45	85	69
26	77	55	76	60	64	49	42	39	35	31	31	28	44	22	36	28	54	35	63	40	66	42	89	65
27	82	56	72	52	54	46	51	35	35	29	29	25	47	33	40	24	40	34	59	52	71	42	88	65
28	73	66	76	46	62	43	71	34	40	29	29	19	46	23	43	30	38	31	74	52	77	46	84	66
29	82	68	80	52	59	52	63	55	36	22	34	24	54	34	.....	.....	42	29	70	56	80	48	82	63
30	73	63	80	56	56	48	67	49	29	22	25	16	53	28	.....	.....	52	24	58	43	82	54	83	64
31	71	59	82	67	.....	.....	75	55	.....	.....	20	4	58	30	.....	.....	56	34	.....	.....	84	54	.....	.....
Range	40°		42°		38°		57°		52°		56°		57°		48°		65°		52°		50°		43°	
Monthly means	75°. 0		72°. 9		62°. 3		49°. 7		42°. 3		24°. 8		30°. 3		37°. 5		37°. 4		51°. 6		59°. 2		72°. 2	

Maximum, minimum, and mean temperatures—Continued.

STATION, MOUNT WASHINGTON, N. H.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	60	41	55	43	58	50	27	22	42	25	3	— 3	5	—12	27	20	19	—19	29	17	33	26	62	47
2	58	49	60	45	50	30	28	23	42	37	11	0	5	—16	26	15	31	10	35	20	27	14	57	51
3	56	50	64	47	40	30	37	27	40	19	8	2	—16	—25	24	18	32	15	22	13	16	11	61	44
4	54	48	61	48	41	32	35	25	20	12	22	7	— 2	—29	22	11	22	— 4	25	14	20	12	49	37
5	56	45	64	52	33	24	25	19	19	11	22	5	5	— 2	23	15	1	— 8	27	17	26	14	46	33
6	55	36	67	55	33	24	37	22	25	14	18	10	20	5	20	6	0	—10	20	12	34	20	47	37
7	50	35	68	55	40	31	30	15	36	17	10	5	21	9	19	9	10	—10	19	5	28	20	48	45
8	57	47	57	48	41	35	21	11	42	33	8	2	22	0	12	0	29	— 5	26	14	32	19	55	46
9	57	47	66	48	38	29	19	8	40	22	11	—28	0	— 25	4	— 5	34	1	24	16	24	18	54	46
10	63	54	71	55	36	28	30	18	35	28	—20	—38	5	—11	10	— 4	1	—10	21	15	21	18	57	32
11	63	52	72	55	39	31	22	9	35	30	6	20	7	— 2	23	8	7	— 8	21	16	32	17	54	27
12	63	55	65	57	37	31	20	6	35	19	29	— 4	3	—11	26	— 5	16	5	16	5	36	25	56	40
13	61	53	65	54	45	29	25	15	30	18	22	4	— 1	—15	— 5	—16	21	13	20	10	41	30	54	42
14	60	49	68	55	42	30	35	25	32	17	20	17	— 4	—23	5	— 9	20	14	28	15	42	32	49	40
15	50	43	65	46	43	33	27	6	20	15	20	11	11	—18	16	0	16	— 8	26	18	46	34	59	39
16	54	42	52	38	44	26	20	5	20	18	6	—40	20	5	18	8	— 4	—10	22	19	55	41	53	47
17	60	43	52	41	48	36	20	10	22	16	— 6	—47	7	— 1	18	—11	1	— 4	27	22	49	42	47	38
18	57	52	55	42	49	38	17	12	30	18	15	— 6	8	5	— 7	—15	13	—17	28	21	50	45	57	38
19	64	51	51	45	44	39	27	17	30	24	— 5	—25	19	3	— 7	—14	— 9	—21	27	17	50	40	53	31
20	61	52	46	29	42	36	37	27	30	22	—10	—29	26	— 4	0	—10	13	—12	41	25	45	36	48	28
21	56	34	51	20	46	37	41	37	31	19	4	—10	— 2	—15	21	— 3	31	9	32	18	45	35	49	40
22	54	35	37	27	50	42	46	38	32	23	15	2	10	— 3	27	20	26	15	32	20	41	30	47	27
23	48	40	52	31	50	42	48	43	23	17	15	— 9	0	— 6	35	24	29	26	43	30	30	25	35	25
24	41	37	52	40	51	40	48	26	17	8	3	—19	— 3	—25	26	16	28	13	49	37	30	24	51	34
25	39	32	63	44	48	42	27	19	9	5	12	2	—25	—36	22	12	30	16	37	24	28	21	49	43
26	37	32	56	36	44	32	22	17	11	5	17	9	5	—25	20	7	31	22	28	16	31	24	45	39
27	45	33	40	30	32	23	17	8	7	2	12	— 4	13	— 2	12	5	36	30	35	24	34	24	46	40
28	53	44	35	28	30	21	11	5	12	— 3	3	— 6	11	— 4	11	4	36	30	41	28	46	34	52	40
29	50	41	38	31	39	28	17	5	7	— 3	17	2	19	6	.....	.....	30	3	39	22	55	41	47	43
30	52	40	45	30	35	27	30	14	0	—10	7	—11	24	15	.....	.....	12	— 4	30	33	53	42	50	41
31	54	42	53	38	.....	.....	39	25	.....	.....	—11	—13	28	18	.....	.....	25	10	.....	.....	55	44	.....	.....
Range	32°		52°		37°		43°		59°		69°		64°		51°		57°		44°		44°		37°	
Monthly means	49°.4		48°.6		37°.8		23°.9		21°.5		0°.6		1°.1		10°.8		11°.5		24°.1		38°.4		44°.8	

Maximum, minimum, and mean temperatures—Continued.

STATION, NASHVILLE, TENN.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	93	77	82	64	85	72	49	44	77	51	28	19	30	19	66	43	52	41	67	54	64	37	87	60
2	92	78	83	67	76	64	62	44	69	51	27	15	24	7	60	52	52	45	54	40	63	39	89	63
3	93	74	84	66	79	56	71	44	55	46	29	11	29	— 8	54	47	65	38	57	38	77	54	90	63
4	94	75	83	68	82	60	57	50	57	37	34	19	35	15	52	43	58	29	58	47	55	48	91	67
5	89	71	84	70	86	64	62	46	69	49	36	17	45	31	54	40	44	28	68	47	67	53	79	67
6	89	71	88	72	87	68	72	56	61	48	49	19	41	35	47	33	51	27	59	48	65	47	83	61
7	91.5	73	88	71	91	73	57	42	48	37	50	37	44	36	55	33	57	35	60	52	70	57	89	62
8	92	73	87	74	91	71	65	36	47	36	47	21	40	9	59	35	63	31	61	53	69	51	75	69
9	93	75	88	71	91	69	62	39	50	38	21	6	22	— 7	55	36	31	24	55	44	66	45	75	57
10	94	76	87	71	90	71	70	38	50	30	37	15	40	13	55	60	40	19	56	46	70	43	71	51
11	95	75	84	71	75	64	56	39	63	32	49	30	52	32	60	31	55	27	60	49	72	53	79	49
12	93	75	79	75	75	63	67	41	69	42	54	34	62	40	62	39	56	44	68	47	78	58	82	60
13	92	73	87	72	81	58	72	44	72	54	64	39	40	30	44	34	56	40	64	53	77	61	86	62
14	91.5	75	88	71	76	62	72	47	66	46	58	40	32	28	48	37	51	31	67	45	80	62	75	67
15	94	75	91	73	67	55	49	32	47	40	40	19	62	37	50	41	48	26	71	47	83	65	73	65
16	93.5	73	92	74	73	55	59	29	34	38	35	25	57	34	50	40	75	34	77	54	83	65	83	67
17	94	76	92	77	73	53	65	33	53	46	53	19	44	32	54	29	44	31	77	61	86	63	90	69
18	94	77	92	75	78	52	74	40	53	47	48	15	51	34	62	29	57	26	70	59	89	64	89	72
19	95	78	95	77	82	55	73	54	47	30	38	9	53	42	59	41	72	45	68	57	90	65	92	69
20	97	78	91	74	77	58	74	61	42	25	46	19	56	31	46	29	72	44	65	55	90	66	90	72
21	92	72	88	71	75	63	79	62	60	33	50	37	38	23	57	25	61	42	70	49	89	71	91	73
22	90	72	92	72	75	64	68	58	47	33	49	38	43	33	54	39	62	34	78	49	91	63	90	68
23	89	70	90	75	79	65	60	49	51	35	38	26	41	29	48	40	74	43	80	52	74	61	84	61
24	74	64	92	71	82	61	65	44	51	27	33	26	36	27	43	37	70	49	80	51	72	54	89	67
25	80	58	89	74	83	62	60	41	44	35	32	26	40	20	37	32	49	36	72	58	70	51	93	72
26	85	62	81	68	76	59	61	39	48	29	29	20	51	26	42	30	54	32	67	57	72	48	91	75
27	89	70	80	61	68	49	75	40	50	43	26	21	55	39	56	31	57	36	72	59	78	50	87	69
28	85	73	83	60	71	44	78	59	50	39	30	24	57	29	58	32	57	39	76	56	80	58	87	66
29	86	69	86	63	64	51	80	62	49	37	28	20	62	31	.....	.....	60	36	63	47	80	55	97	68
30	83	66	90	68	56	42	78	58	37	23	20	8	64	38	.....	.....	67	40	59	41	82	55	96	73
31	82	68	91	74	.....	.....	78	54	.....	.....	23	— 2	65	44	.....	.....	75	57	.....	.....	86	57	.....	.....
Range	39°		35°		49°		51°		54°		66°		73°		41°		56°		49°		54°		47°	
Monthly means	80°.9		78°.7		69°.2		56°.7		46°.4		30°.8		37°.0		45°.0		47°.4		59°.2		67°.3		77°.0	

Maximum, minimum, and mean temperatures—Continued.

STATION, NEW HAVEN, CONN.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	84	65	80	59	82	64	60	45	66	46	25	9	31	18	50	36	48	30	48	39	65	49	86	63
2	92	71	78	60	77	60	62	45	64	50	27	9	30	16	47	36	58	33	50	40	53	39	83	60
3	90	76	76	60	71	52	63	43	64	47	40	25	30	13	48	35	56	40	50	35	57	37	85	60
4	92	71	78	61	75.5	55	64	53	58	41	36	24	27	6	43	34	53	30	47	38	60	45	81	65
5	86	73	83	68	66	53	53	49	58	41	40	22	30	10	45	39	48	26	45	35	60	37	75	56
6	82	70	88	68	70	48	71	47	59	32	45	25	33	4.5	44	31	35	23	53	39	59	44	69	60
7	84	61	90	71	68.5	52	63	44	51	43	45	22	47	29	46.5	30.5	58	38	55	35	63	38	67	60
8	91	72	86	74	70	60	60	38	55	45	45	31	47	24	45	28	53	28	54	33	60	40	73	61
9	93	72	83	67	68.5	57	56	34	56	43	43	17	31	12	40	23	53	34	52	40	53	43	68	61
10	63	68	85	62	68	58	63	42	47	37	25	12	25	7.5	40	29.5	35	24	56	36	50	41	76	64
11	89	72	84	63	65	55	55	38	55	39	22	11	40	19	50	30	42	19	57	39	55	44	68	57
12	89	71	85	65	70	53	55	32	54	38	35	13	38	18	50	30	45	35	50	38.5	65	45	70	57
13	92	73	84	66	68.5	54	61	41	58	38	50	32	25	9	35	14.5	45	34	52	32	72	45	73	60
14	89	75	84	72	72	57	64	38	58	41	47	36	35	7.5	37	15	39	30	52	34	75	50	80	63
15	90	69	86	71	72.5	62	46	32	55	36	43	27	27	16	48	20	35	23	57	33	80	55	80	64
16	85	68	84	71	66	55.5	53	34	47	34	40	11	45	22	50	34	48	26	60	33	75	61	80	66
17	81	70	81	70	69	50	55	36	52	30	20	3	33	19.5	40	23	38	19	57	41	83	61	76	66
18	88	73	76	67	72	63	59	34	55	39	28	9	35	19	40	19	30	16	48	40	87	63	80	59
19	90	74	75	64	70	58	62	35	45	37	30	10	40	20	40	17	35	12	48	39	80	63	85	67
20	88	72	81	60	66	56	65	40	47	37	25	8	45	30	35	16	40	14	50	41	85	59	72	60
21	86	72	70	52	60.5	55	65	53	46	39	12	7	35	23	45	31	52	22.5	56	39	68	53	75	53
22	79	65	75	54	65	53	64	55	48	38	25	10	35	22	50	30	51	41	56	39	69	53	70	56
23	80	63	72.5	59	65	50	64	57	50	37	35	20	35	21	49	32	57	38	73	42	68	50	70	52
24	76	59	77	59	63	56	64	49	45	36	23	15	30	12	40	30	60	40	71	43	56	45	75	55
25	76	56	81	68	61.5	55	57	46	45	31	23	14	30	12	40	34	50	35	65	49	60	46	85	64
26	75	58	77	63	58	48	56	43	42	32	35	18	38	17	43	32	57	37	65	45	63	49	85	60
27	78	53	75.5	58	58	44	50	38	44	31	36	23	44	29	41	32	55	42	65	48	60	48	73	59
28	80	68	75	52	60.5	46	50	36	45	29	29	13	38	23	46	29	45	22	58	46	70	48	72	58
29	84	69	77	54	68	50	48	31	43	31	40	15	40	27	.....	.....	39	27	63	45	74	51	74	58
30	70	62	76	59	62	50	54	31	35	18	40	21	43	23.5	.....	.....	48	30	64	43	75	58	73	61
31	66	57	78	61	.....	.....	63	40	.....	.....	35	19	45	25	.....	.....	50	34	.....	.....	84	54	.....	.....
Range	42°		38°		39°		40°		46°		47°		43°.5		35°.5		48°		41°		50°		34°	
Monthly means	77°.2		72°.4		61°.3		51°.0		44°.2		25°.9		28°.3		33°.9		38°.0		48°.4		59°.5		69°.5	

Maximum, minimum, and mean temperatures—Continued.

STATION, NEW LONDON, CONN.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	83	67	70	59	83	65		47	60	43	24	10	31	19	49	34	48	27	43	37	65	43	81	60
2	87	70	76	60	75	61	61	45	64	50	26	9	27	16	48	33	50	30	55	38	55	40	75	59
3	88	72	74	59	73	54	62	43	65	47	37	25	24	9	49	35	51	36	51	39	59	34	83	56
4	90	71	73	58	77	56	66	55	58	41	39	22	21	1	45	34	51	29	46	37	61	43	79	64
5	84	72	81	65	67	55	58	49	53	40	41	25	24	8	45	29	38	25	41	35	55	37	76	60
6	82	71	86	67	70	48	67	48	49	33	39	24	36	6	42	30	34	22	52	36	60	44	67	58
7	84	65	87	70	69	53	61	46	55	44	42	30	43	35	46	29	50	29	55	36	60	39	65	59
8	91	70	86	72	66	58	58	38	56	47	38	29	44	30	42	30	49	28	53	33	58	44	68	58
9	93	69	83	68	69	56	51	37	54	43	38	14	31	13	39	22	58	34	52	40	52	42	65	55
10	76	67	77	69	69	53	61	45	48	37	16	8	30	9	38	21	35	22	55	37	52	41	73	61
11	86	71	77	64	65	55	57	39	48	40	21	8	34	17	47	28	36	21	60	40	54	41	64	56
12	86	71	77	67	70	53	51	33	49	38	31	19	33	19	47	29	43	32	50	37	62	42	67	52
13	92	72	78	67	67	55	59	42	57	38	45	27	24	13	29	13	42	33	48	33	69	43	67	57
14	89	74	81	70	69	57	62	38	54	44	45	35	30	16	38	14	36	27	51	34	74	47	76	59
15	89	71	86	71	73	60	50	33	44	37	40	25	35	16	43	20	36	25	54	33	76	52	76	61
16	85	68	86	69	67	53	50	32	46	35	41	6	45	24	46	33	37	21	53	35	76	54	72	62
17	86	67	73	66	67	52	55	39	46	32	14	3	(*)	20	40	22	34	25	50	42	84	55	79	63
18	86	71	72	65	69	63	55	32	47	41	45	11	.....	22	33	16	28	15	47	42	84	61	75	58
19	91	73	72	63	71	60	57	36	44	40	25	9	.....	20	32	20	28	8	48	40	84	58	80	63
20	82	70	83	61	68	57	58	38	48	41	24	9	.....	32	31	15	36	14	51	43	83	55	70	58
21	87	71	68	52	61	55	66	53	46	41	24	11	.....	22	46	25	48	27	55	38	65	52	69	54
22	77	66	76	52	66	54	64	53	46	38	31	15	.....	22	52	28	50	38	56	40	64	51	72	58
23	72	64	71	59	65	52	64	57	48	40	36	16	.....	19	51	29	57	38	72	42	70	49	69	49
24	75	59	73	60	63	57	66	50	45	35	21	10	.....	10	37	31	59	38	73	45	62	44	71	56
25	75	60	80	67	60	52	50	47	44	30	28	8	23	— 9	42	33	47	36	71	46	61	42	80	62
26	75	62	78	64	60	50	54	42	43	32	35	22	34	13	44	33	52	37	66	45	60	45	80	59
27	72	55	73	59	60	45	49	36	42	29	35	19	47	30	43	31	54	44	64	46	64	48	71	58
28	76	65	75	56	61	47	45	32	43	28	30	12	35	23	43	27	50	33	58	47	67	46	67	54
29	81	68	77	55	67	56	48	30	42	28	41	21	42	25	.....	.....	40	27	61	45	72	40	69	57
30	71	62	76	59	65	53	54	34	34	24	42	23	47	25	.....	.....	46	28	60	43	73	51	68	55
31	67	59	78	62	.....	.....	56	37	.....	.....	29	11	44	25	.....	.....	48	33	.....	.....	79	53	.....	.....
Range	38°		35°		38°		37°		41°		42°		.....		39°		51°		40°		50°		34°	
Monthly means	74°.3		70°.5		61°.3		50°.3		44°.0		25°.5		26°.9		34°.3		36°.9		47°.1		56°.6		65°.7	

* Maximum thermometer broken.

Maximum, minimum, and mean temperatures—Continued.

STATION, NEW ORLEANS, LA.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min	Max.	Min.	Max.	Min.	Max.	Min.
1	89	76.5	88	77	90	78	65	.....	79	63	45	32.5	43.5	37	69	55.5	68	58	75	63	72	56	84	70
2	89	77	89	77.5	90	79	65	.....	70	61	43	31	51	35	71	55	68	53	73	64	76	58	84	70
3	88.5	77	87.5	76	90	78	71	56	64	56	44.5	32.5	44	35	72	58	71	47	70	57	77	57	85	68
4	90	78	88	74	89.5	78.5	76	59.5	70	55	47	32	54	32.5	59	55	72	57	74	61	77	62	85	69
5	89.5	77	84	74.5	91	78	80	64	69.5	62	44	33	56	40	63	52	64	47	80	61	82	66	88	75
6	88.5	77	88	75.5	91	78.5	80	66.5	76	62	51	38	51	45	62	49	60	40	78	63	79	66	89	74
7	85	77	85	77	89.5	78	75	65	66	54.5	50	45	55.5	37	65	50	69	46	77	67	76	66	90	76
8	87	77	83	73	90	79	72	57.5	59	48	59	47	60	34	66	51	70	58	75	65	74	61	88	77
9	89.5	77	81.5	73.5	87	78	74	61	59	46	55	43.5	43	26	66	50.5	58	44	74	61	72	56	88	76
10	92	78.5	83	75	89	79	78	61	62	46	65.5	40	59	33	64	51.5	55	39	72	58	76	61	76	67
11	91	78	84	76	86	76	75	63.5	70	45	65	52	70	47	65	48	64	44	73	60	77	61	81	67
12	88	77.5	87	76	81	73	73	56	71.5	55	63	49	69	58	65	51.5	73	55	65	57	77	64	84	71
13	89	78	88	77	83	71	76	61	74	60	70	45	73	63	69	53	69	60	63	55	76	69	85	75
14	90.5	78	89	76	85	75	74	61	75	59.5	72	54	74	60	57	50	75	56	71	56	78	70	85	76
15	90	79	87	77	80	71	68	59.5	64	55	69	47.5	76	65	53	47	70	58	74	55	78	68	86	76.5
16	90	75.5	90	77	77	66.5	68	53	67	52	58	40.5	69	53	51	46.5	74	57	74	58	79	66	85	76
17	89	77.5	91	78	79.5	68	75	62	71	57.5	68	41	56	51	58	46	67	49	74	62	80	64	87	77
18	91.5	78.5	88	79	80	67	76	61.5	69	60	58	38	73	54	62	49	63	43	75	67	80	66	87	75.5
19	91	79	90	78	84	69	76	65	61	50.5	44	30	74	60	68	49	70	46	80	62	80	71	85	76
20	90	78	91	78.5	82	73	84	65	58	45	56	37.5	74	66	60	49	74	57	75	60	83	68	87	74
21	91	78.5	91.5	79	82	(*)	82	67	68	41	67	48	68	58.5	55	49	72	60	77	59	85	70	89	76
22	92	80	86	76	84	.....	77	59.5	67	54	68	60	60	53	56	46	70	52	78	60	90	72	90	76
23	92	79	88	77	85	.....	70	55	61	48.5	60	47	56	44	66	47	72	51	71	63.5	92	74	91	78
24	91.5	78.5	89	77	86	.....	77	56	52	46	54	46	53	40.5	59	48	70	56	71	62	85	76	91	77
25	89	77.5	91	80.5	89	.....	75	61	58	45	46.5	40	53	39.5	60	48	56	49	78	62	83	70	92	78
26	84.5	76	90	80	91	.....	76	58	63	44	44	37.5	57	44	59	46	69	50	78	64	83	69	93	78
27	89	77	91.5	79	81	.....	79	60	73	49	48	37	60	46	62	44	77	54	79	68	83	71	92	78
28	89	78	89	78.5	79	.....	77	61	73	56	57	44	60	48	69	48	72	55.5	75	68	83	69	92	80
29	89	79	92	79.5	81	.....	76.5	59	76	55	48	34	66	45	.....	.....	73	61	71	60	79	68.5	94	78
30	92.5	76	90	80	72	.....	78	60.5	55	39	39	28	66	45	.....	.....	76	62	70	60	81	68	93	79
31	89	79	91	81	.....	.....	77.5	60.5	.....	.....	58	33	69	47	.....	.....	75	60	.....	.....	84	67	.....	.....
Range	17°		19°		.....		.....		40°		44°		48°		30°		38°		25°		36°		27°	
Monthly means	83°.4		82°.2		79°.1		67°.6		59°.2		46°.1		53°.7		55°.9		60°.7		68°.6		73°.5		81°.3	

* Minimum thermometer broken.

Maximum, minimum, and mean temperatures—Continued.

STATION, NEWPORT, R. I.

Day of month.	1876.												1877											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	81	68	77	60	76	65.5	60	49	59	48	22	12	29	19	42	33	45	29	43	38	55	44	80	58
2	79	69	79	60	75	61	60	49	60	51	26	10	28	15	46	33	46	32.5	50	39	49	40	75.5	59
3	79	68	75	60	70	56	62	47	60	44	40	25	25	12	43	33	47	37	46	37	55	36	78	57
4	82	66	76	58	73	57	65	57	56	43	39	25	19	7	42	31	43	27	44	34	56	44	77	62
5	83	68	79	65	67	55	65	50	52	39	42	29	23	11	41	29	35	26	40	33	56	41	72	60
6	86	68	82	68	71	52	66	49	52	37	39	28	36	15	41	30	32	23	48	35.5	56	42	68	59
7	83	66	82	70	71	55	61	47	56	43	41	33	44	33	42	30	48	27	54	37	56	41	68	59
8	86	68	87	71	66	58	56	43	52	47	39	31	43	32	42	29	47	30	50	34	58	42	71	57.5
9	91	67	82	66	67	54	51	39	54	43	40	14	34	15	37	25	50	33	52	37	48	40	65	57
10	77	66	80	65	69	51	59	47	48	39	16	9	32	13	37	24	34	24	51	35	48	39	68	60
11	85	69	80	66	67	56	57	40	48	39	19	7	35	20	43	29	34	21.5	55	37	55	41.5	64	55
12	83	70	81	68	70	54	49	36	49	40	30	16	35	20	43	28	42	33	47	36	56	41	68.5	54
13	89	71	80	67	67	57	57	45	55	40	45	28	35	19	29	16	40	30.5	49	32	68	45	68	57
14	88	73	83	69	70	58.5	60	43	50	41	47	38	24	15	36	17	36	27	50	36	67	48	68	57
15	86	71	82	70	73	61.5	57	30	45	36	41	26	30	17	39	24	38	25	52	32	71	53	74	61
16	84	67	79	67	67	53	49	33	44	34	41	6	35	16	42	34	35	23	56	36	74	51.5	66	61.5
17	80	68	71	64	66	53	54	40.5	47	34	15	3	40	25	39	21	32	26	47	42	83	52	83	63
18	77	69	74	64	74	63	55	36	47	41	48	12	28	17	33	17	26	16	48	42	72	55	77	59
19	87	68	75	64	68	60	55	38	45	41	27	12	34	21	36	12	26	12	47	42	79.5	55	77	61.5
20	79	67	84	61	66	54	59	44	49	43	20	10	36	28	31	16.5	36	18.5	51	42	72	54	69	57
21	87	69	69	55	59	52	66	52	47	41	22	11	41	33	42	25	47	29	53.5	39	61	50.5	70	58
22	79	63	75	57	67	51	62	51	43	38	32	16	34	23	45	31	49	40	47	41	60	49	74	58
23	72	62	71	60	66	51	62	54	47	38	33	18	33	25	45	29	54	38	67	40	67	48.5	67	52
24	76	60	72.5	59	63	56	66	51	44	34	23	16	31	21	37	31	54	38	68	45	52	45	67	57
25	74	61	76	61.5	66	54	58	47	41	32	25	12	29	13	38	33	47	36	69.5	45	56	44	74	60
26	74	60	80	65	63	50.5	53	44	38	30	33	18	21	10.5	42	33	48	38	67	46	58	45	75	59
27	75	59	73.5	61	59	48	49	38.5	42	30	35	22	34	19	40	31	53	42	63	46	60	48	72	57
28	78	66	77	58	61	49	45	34	42	31	29	18	34	20	40	28	49	38	58	45	60	46.5	71	55
29	80	68	76	58	67	58	48	31	41	31	45	21	39	26	.....	.....	40	32	53	44	65	51	70	57
30	75	65	76	61	66	55	54	32	34	21	39	22	42	27	.....	.....	42	31	56	42	67	52	71	57
31	66	59	78	62	.....	.....	55	40	.....	.....	29	20	39	29	.....	.....	49	33	.....	.....	74	53	.....	.....
Range	32°		32°		28°		36°		39°		45°		37°		30°		42°		37°.5		47°		31°	
Monthly means	73°.4		70°.5		61°.3		50°.8		43°.8		26°.4		27°.0		33°.8		36°.4		45°.4		54°.0		65°	

Maximum, minimum, and mean temperatures—Continued.

STATION, NEW YORK, N. Y.

Day of month.	1876.												1877.									
	July		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
		71																						
1	83		81	61	86	65	61	45	68	47	22	14	25	10	52	35	54	30	46	31	59	46	85	65
2	94	72	79	64	75	63	62	45	73	53	25	13	28	18	51	39	51	36	52	37	52	42	88	61
3	88	75	76	64	74	57	64	46	65	48	36	23	23	9	44	36	51	40	55	30	58	36	85	66
4	90	72	76	65	77	57	63	50	60	42	37	25	20	6	49	34	50	31	46	37	60	45	81	66
5	86	72	82	67	70	55	55	48	57	42	41	23	26	7	42	30	37	25	48	34	58	45	73	64
6	85	70	87	67	74	51	73	48	52	39	39	24	33	15	44	29	36	21	52	35	62	46	67	61
7	88	69	90	70	65	59	60	47	55	49	43	26	45	33	46	28	50	30	55	37	65	43	70	60
8	98	69	89	72	73	60	57	38	54	44	39	27	40	25	45	30	54	32	56	31	58	48	77	60
9	99	77	86	71	75	60	52	37	60	42	39	8	28	13	45	23	55	29	54	36	54	45	76	62
10	84	70	83	69	68	56	64	42	47	40	18	— 2	31	14	44	27	32	19	60	38	52	44	77	63
11	90	72	83	69	61	52	59	40	47	38	24	12	33	15	52	29	38	20	66	39	56	42	69	58
12	91	71	85	69	69	57	52	35	53	37	36	19	35	22	52	27	45	32	56	40	62	47	71	55
13	97	76	84	70	72	57	62	39	64	38	49	30	31	17	30	15	43	35	50	36	68	46	74	59
14	89	75	83	71	71	62	66	44	62	44	49	36	31	16	45	14	38	31	57	37	74	50	80	61
15	93	73	89	71	76	58	44	31	46	39	42	22	32	20	45	23	37	22	57	38	80	53	83	63
16	87	71	86	72	66	58	49	32	50	38	38	5	46	29	48	32	35	25	62	37	80	59	75	65
17	84	69	80	69	71	52	56	39	49	38	19	3	32	23	45	24	34	21	62	43	84	63	82	65
18	88	72	77	66	73	63	58	36	52	42	37	12	36	23	36	21	30	13	49	42	85	63	79	64
19	95	72	76	66	71	58	62	40	46	42	23	10	40	26	38	22	27	10	47	40	90	66	89	65
20	93	74	85	64	70	58	61	45	47	42	27	10	45	33	36	18	35	17	52	42	86	62	74	62
21	88	72	73	56	67	57	63	54	51	40	26	13	38	23	49	28	54	27	52	39	69	57	75	57
22	80	68	78	55	61	55	62	55	48	40	33	15	32	23	58	33	52	42	67	40	77	54	71	59
23	81	66	80	65	65	54	62	54	48	38	32	19	36	22	49	33	64	40	77	41	68	53	69	53
24	76	64	78	66	63	58	65	53	44	34	23	15	28	12	38	30	64	40	81	48	54	42	78	54
25	75	60	83	68	70	58	54	44	45	32	27	13	27	10	44	33	46	36	65	51	62	45	84	64
26	78	60	82	67	62	54	52	39	41	34	37	23	35	17	41	31	44	36	68	44	63	49	87	66
27	77	63	77	61	58	46	46	39	39	30	39	25	50	25	46	30	54	40	63	50	65	51	73	62
28	82	66	78	57	64	45	43	35	42	33	30	16	38	27	48	32	41	28	53	45	70	47	71	60
29	85	67	79	62	70	53	51	34	43	29	40	23	47	25	.....	.....	34	28	64	44	77	47	72	59
30	75	65	85	63	61	52	53	35	35	21	32	21	49	30	.....	.....	50	31	62	45	79	55	77	60
31	67	61	81	67	.....	.....	56	44	.....	.....	31	15	47	27	.....	.....	50	37	.....	.....	84	60	.....	.....
Range	39°		35°		41°		42°		52°		51°		44°.		44°		54°		51°		54°		36°	
Monthly means	77°. 2		73°. 4		63°. 5		50°. 3		44°. 9		25°. 5		27°. 6		36°. 0		36°. 6		48°. 0		58°. 9		69°. 1	

Maximum, minimum, and mean temperatures—Continued.

STATION, NORFOLK, VA.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	95	73.5	72	70	93	75	60	50	76	55	31	23	35	24	66	46	54	34	71	45	60	47	84	59.5
2	94.5	76.5	88	71	80	68	60	49	76.5	58	34	20	30	22	66	46	64	43.5	63	50	56	43	88	61
3	95	77	91	73	76	63	66	44.5	74	55	37	28	31	17	61	44	57	48.5	50	39	62	43	95	68
4	96.5	76	89	75	82	62	73	51	55	48	36	28	25	16	44	39	68	43	49	41	63	47	90	72
5	95	78	89	75	74	64	75	55.5	55	46	33	29	40	18	43	40	42.5	34	55	43	55	49	90	71
6	93	77	89	73	80	63	78	63.5	66	45	44	28	54	30	46	40	42	33	63	42	53	50	89	64
7	88	76	91.5	74	88	67	68	54	63	50	50.5	33	55	40	62	39	60.5	35	57	48	62	43	82	63
8	96	73.5	90	73	91	71	60	49	53	45	51	36	49	33	49	36	66	46	49	43	55	48	94	66
9	96	78	82.5	73	80	71	62	51.5	53	42	40	14	33	20	41	35	66	35	46	40	53	46	90	70
10	102.5	80	86	74	77	68	68	57	50	43	26.5	11	32	24	43	33.5	41	26.5	44	39	63	44	86	70
11	102	81	88	71	79	67	60	50	51	42	41	26	46	25	52	35	45	30	55	39	64	47	70	59
12	99	80	89	74	71	67	55	46.5	56	40	49	36	52	40	63	37	61	35	59	42.5	58	51	66	61.5
13	98	77	84	73	73	64	59	48	69	46	58	35	58	39	43	28	65	44	48	44	68	50	80	65
14	96	76	85	73	80.5	64	74	47	72	51	59	41	42	38	36	27	52	43	50	41	73	50	83	69
15	94	74	83.5	71	76	67	61	31	63	49	51	34	57	37	48	30.5	48.5	34	55	38	81	55	91	72
16	85	75	94	73	70	64	53	33	50	43.5	48	27	73	45	55	37	57	35	69	40	87	60	86	72
17	89	72	96.5	75.5	76	68	65	39	49	44	33.5	19	49	35	47	32	57	30	78	52.5	91	64	85	71
18	94	69.5	87	77	79	65	55	44	55	45	38	19	39	33	48	30	34	24	72	59	93	67	88	70.5
19	98	74	88	75	77	63	67	38	60	52	38	19	47	37	63	37	55	29.5	73	59	89	68.5	95	73
20	99	78	85	75	77	64	66	58	57	42	32	23	68	45	39	28	46	31	76	62.5	96	71	81	69
21	88	77	77	67	75	64	66	61	51.5	46	40	29	60	35	58	32	69	38	64	49	94	66	93	70
22	90	70.5	82	63	71	64	66	59	60	42	49	34	35	32.5	63	36	58	42	63	49	90	67	81.5	67
23	94.5	73.5	86	66	80	67	75	55	52	41	48	33	39	33	55	44	60	44	68	47	73	63	75	62
24	78	65	83	70	74	66	68	56	44	37	33	23	41	27	55	42	77	45	77	54	63	53	86	61.5
25	80	60	89.5	71.5	68	63	61	47	48	36	31.5	24	41	24	48	40	68	54	69	58	64	48	94	71
26	84	64	83.5	71.5	80	60	56	41	43	34	33	29	51	29	44	36	73	55	60	49	71	54	99	71
27	85	65.5	77	68	63.5	52	53	42.5	56	32	34	30	57	37	41	33.5	57	43	65	49	72	56	86	72
28	93	66	80	64	70	53	65	40	45	40	33	29	42	34	52	32	56	40	79	59	73	54.5	85	67
29	90	69.5	85.5	63.5	70	54	64	54	46	38	56	32	59	32	.....	.....	56	39	83	65	79	58	77	64
30	87	71	86	66	76	56	58	53	40	31	38	27	52	38	.....	.....	56	38	66	58	70	54	91	63
31	77	68	89	72.5	.....	.....	70	55	.....	.....	32	23	57	33	.....	.....	58	40	.....	.....	82	55	.....	.....
Range	49°.5		33°.5		41°		47°		45°.5		48°		57°		39°		53°		43°		53°		40°	
Monthly means	81°.7		78°.2		69°.7		56°.8		49°.4		33°.6		39°.0		43°.5		47°.4		55°		63°.1		75°.5	

Maximum, minimum, and mean temperatures—Continued.

STATION, NORTH PLATTE, NEBR.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	68	52	84	68	74	46	70	22	42	28	35	2	38	10	50	28	35	25	35	21	60	39	72	40
2	100	48	86	66	85	51	80	30	45	16	50	12	27	8	54	25	38	10	50	24	52	41	77	48
3	91	62	94	64	93	57	49	42	55	17	31	13	35	10	54	26	19	4	55	34	60	39	83	53
4	95	60	94	64	94	63	49	37	55	22	42	10	36	18	45	30	35	5	65	34	68	36	74	47
5	90	54	84	66	87	61	77	37	53	30	58	15	44	20	49	24	40	8	68	32	54	42	81	45
6	103	69	91	55	84	65	68	38	48	22	40	18	45	29	47	26	31	22	72	34	56	36	68	55
7	98	74	95	64	76	61	55	33	60	21	43	18	29	— 5	42	27	25	10	56	44	71	32	68	45
8	85	69	97	66	68	54	69	32	65	34	29	9	29	—13	39	20	25	1	50	35	70	42	58	45
9	91	52	94	64	60	49	81	40	71	26	46	7	41	25	53	20	25	— 4	52	31	74	45	71	34
10	92	66	73	49	67	43	68	30	79	25	50	28	42	28	59	22	45	10	56	33	74	48	67	44
11	100	66	84	51	72	47	61	35	65	33	60	24	42	—10	41	22	40	27	45	36	62	52	66	42
12	95	67	93	64	60	46	69	36	35	16	62	20	1	—15	31	14	41	19	55	40	54	48	78	48
13	83	62	80	62	62	44	60	38	17	6	45	22	25	—13	45	17	68	25	65	29	70	48	73	52
14	83	64	66	57	67	39	47	28	32	— 3	38	19	26	— 2	55	20	44	17	70	40	75	49	85	53
15	83	65	81	59	79	43	63	22	65	15	54	16	12	—10	46	30	56	27	76	38	81	45	77	53
16	98	69	88	67	83	54	72	33	50	29	35	5	22	—10	50	20	40	22	73	40	72	50	84	55
17	83	69	93	67	81	49	71	30	48	26	19	6	15	0	56	23	60	22	56	42	82	46	95	63
18	95	64	83	67	67	58	69	40	44	11	51	— 1	14	— 4	60	24	68	24	47	35	67	54	79	65
19	96	71	76	65	70	54	52	43	54	21	42	11	37	— 2	49	24	60	28	67	37	77	50	89	58
20	89	58	72	62	71	40	43	39	45	30	34	18	27	— 1	60	25	52	35	70	33	70	45	83	62
21	95	65	88	66	83	45	44	33	45	20	45	19	27	17	54	32	71	31	78	44	77	45	86	57
22	93	68	90	62	70	50	60	27	38	22	30	10	19	— 5	43	30	55	26	65	37	64	54	86	61
23	84	62	88	53	79	40	64	40	54	17	10	— 2	32	—10	45	26	26	19	56	28	65	54	87	60
24	63	58	70	56	70	54	60	29	51	28	11	— 4	30	3	40	18	51	19	53	34	61	52	82	49
25	74	58	74	42	78	39	64	33	51	27	8	—11	34	— 1	32	25	70	29	44	37	58	51	78	53
26	88	66	80	54	71	45	71	33	41	30	10	—25	34	3	30	25	72	35	40	35	59	51	76	51
27	92	57	89	62	85	48	76	40	39	27	17	—14	35	8	32	24	54	35	44	32	78	53	85	55
28	95	70	92	60	67	40	77	34	39	25	15	3	40	4	40	25	55	29	45	27	75	61	77	58
29	97	58	93	62	48	31	70	31	25	11	8	—15	44	9	.....	.....	44	36	49	27	86	63	93	65
30	94	68	94	61	50	21	64	31	20	8	34	4	44	23	.....	.....	52	39	63	28	80	55	83	47
31	92	67	79	59	.....	.....	48	36	.....	.....	34	3	45	27	.....	.....	50	30	.....	.....	65	47	.....	.....
Range	55°		55°		73°		59°		89°		87°		60°		46°		76°		57°		54°		61°	
Monthly means	76°.3		72°.8		60°.1		47°.9		36°.4		21°.2		17°.4		34°.1		32°.7		45°.4		57°.9		66°.2	

Maximum, minimum, and mean temperatures—Continued.

STATION, OMAHA, NEBR.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	75	61	78	69	70	57	58	31	48	33	18	— 3	14	5	58	35	43	36	47	26	61	36	73	54
2	80	61	84	67	73	52	78	38	39	34	23	6	14	— 4	53	33	38	25	43	22	52	44	76	55
3	81	65	85	68	85	63	54	41	51	29	27	11	30	7	53	32	33	13	52	35	58	41	77	55
4	82	63	86	67	84	69	49	37	54	43	33	4	37	20	52	33	32	13	50	37	62	38	76	61
5	80	63	84	69	82	65	67	36	54	34	46	21	38	27	50	30	33	17	64	35	60	42	77	61
6	90	72	81	65	76	67	58	40	37	28	40	25	45	30	52	33	42	28	66	39	52	47	78	62
7	90	75	83	61	81	65	64	34	44	22	43	22	32	1	42	32	28	11	65	49	59	46	74	57
8	86	75	87	68	77	69	61	34	55	35	22	— 4	20	— 3	41	28	16	1	56	42	68	43	67	52
9	86	69	88	71	72	55	75	43	58	36	19	— 5	34	17	48	23	24	3	57	34	70	53	66	42
10	88	66	78	56	60	52	59	34	68	39	43	19	25	9	58	33	45	9	49	43	63	55	71	48
11	87	66	78	54	64	51	52	30	62	45	54	28	25	— 5	45	22	46	34	61	45	57	52	64	51
12	92	69	88	68	58	54	63	40	47	26	57	32	— 1	— 8	29	12	39	28	61	38	57	52	78	51
13	87	71	90	68	61	52	63	48	26	18	47	33	28	— 2	36	23	54	30	65	44	62	54	70	54
14	87	71	72	66	67	49	48	32	27	10	35	8	30	9	40	29	30	17	65	44	74	58	86	58
15	82	69	82	65	69	46	50	23	47	20	52	3	25	—10	48	34	50	29	75	50	67	59	73	65
16	92	71	89	71	72	55	64	37	40	27	13	— 4	8	—16	46	23	39	20	73	52	74	54	83	61
17	94	67	88	72	72	59	68	42	38	29	12	1	24	4	54	29	42	15	77	54	82	66	84	64
18	89	68	84	67	70	61	57	49	36	19	32	— 3	15	— 3	61	33	48	25	63	51	75	66	84	72
19	92	69	81	71	67	63	59	51	37	21	30	9	23	— 5	41	31	44	31	64	48	80	61	85	64
20	84	68	80	69	68	55	59	52	46	30	29	15	22	4	51	24	39	33	66	44	69	57	92	72
21	85	66	83	69	71	50	55	46	30	14	46	12	32	17	59	36	65	31	70	47	73	52	82	63
22	86	70	90	75	75	54	54	44	32	18	29	14	21	4	44	35	50	25	77	52	67	52	83	63
23	70	60	85	74	75	59	67	39	42	22	14	4	39	— 2	35	29	27	17	70	43	69	54	78	66
24	74	57	77	63	78	56	51	36	40	33	18	7	25	7	33	23	38	13	59	39	73	55	82	63
25	77	55	73	54	72	52	55	33	41	29	22	14	32	14	35	27	56	24	59	47	73	53	79	61
26	80	66	77	55	66	51	60	37	41	32	18	— 1	41	12	38	28	62	34	59	49	67	58	77	60
27	83	69	79	57	72	43	71	51	37	22	18	— 1	42	24	42	29	52	31	49	37	73	56	78	64
28	80	64	87	67	61	46	67	44	34	18	20	0	51	26	51	30	55	33	37	33	78	60	87	62
29	86	63	92	74	50	37	75	49	30	8	8	— 3	46	34	.....	.....	50	39	48	33	82	64	86	72
30	84	66	88	75	48	33	68	47	13	1	21	— 7	52	39	.....	.....	50	40	56	34	76	68	84	62
31	85	67	82	60	.....	.....	65	40	.....	.....	20	12	59	34	.....	.....	74	47	.....	.....	76	61	.....	.....
Range	39°		38°		52°		55°		67°		64°		75°		49°		73°		55°		46°		50°	
Monthly means	75°.1		75°.4		60°.0		50°.3		33°.2		19°.2		20°.2		37°.3		33°.7		50°.5		60°.7		69°.1	

Maximum, minimum, and mean temperatures—Continued.

STATION, OSWEGO, N. Y.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	76	57.5	83	62	78	64	54	44.5	62.5	51.5	15	7.5	28	17	50.5	37.5	39	30	49	40	50	38.5	81	61
2	87	63.5	81	63	68	61	59	46	71	53.5	32	9	22	14	47	36	46	32.5	46.5	28	44.5	37	85	64
3	82	71	90	63.5	73	55	66	45.5	63	45.5	30	15.5	22	8.5	41.5	34	45.5	33	34.5	24	39.5	36	80	60
4	77.5	60	89.5	68	69.5	60	55.5	46	47	42	29	21	19.5	6.5	37	24.5	43	26	49.5	28	54.5	38	67	52
5	90	58	86	70	63	54.5	48	42	49.5	36	34	26	27	12.5	38.5	22	33	19.5	45	34	50	37	63	50
6	84	54	85	75	66	58	60.5	44.5	48	36	37	23	31	15	38.5	30	28	11.5	44	34	55.5	41	61	54
7	88.5	60	84	72.5	75	56	50	40	51.5	44	36	27	37	26.5	39	31	28.5	18	40	32	50.5	41	70	56
8	90	65	80	67	73.5	62.5	45	39	47	40.5	33	23	35	13	33.5	18.5	44	19	46	29.5	49.5	40	76	56
9	90	65	86	62	66.5	55	50	34.5	44	39	32	3	20	6.5	32	19	50.5	18	46	32.5	47	39	85	69
10	87	71	87	65	68	49.5	53	43	46.5	36	13	1	27.5	6.5	46	21	26	14	50.5	35	45.5	41	75	52
11	79	65	88.5	70	61	52	44	36	44	37	21	5	31	25	41.5	24	38.5	16	49	33	53.5	42	68	48
12	87	64.5	85	72	64	49	45	34	45.5	41	36	4	28	— 9	45	15	36	25.5	43.5	34	60.5	43	81	55
13	84	70.5	84	71	64	45	53	39	53	34.5	46	30	20	— 3.5	23.5	12.5	31	23	47.5	33	64	43	86	55
14	81	68	85.5	73	70	51	51.5	34	53	36	40	34	23	14.5	29	10.5	42.5	21	48.5	36	67	47	75	59
15	86	63.5	81	73	64.5	56	39	29	39	34	40	19	29	15	39	15	28	22	52	36	74.5	50	87	61
16	84	61	76	60	63	49.5	47.5	35	41	32	32	0	27	13	42	26.5	33	18	62.5	37	81	59	72	53
17	97.5	65	80	63	60	52	48	38.5	48	36.5	9	— 1.5	29.5	13	37	21	24	6.5	60	42	73	54	76	53
18	80.5	70	81	60	67.5	56	46.5	36	49	41.5	27	— 1	29	7	30.5	17	18	5	58.5	40.5	81	56	87	54
19	91	66.5	83.5	68	58.5	52	61	33.5	47	39	23	1	39	25.5	29	15	30.5	5	48	40	71	52	73	57.5
20	91	63	74	60	62.5	51.5	68	44	45.5	39	14.5	1	43.5	23	34	20	34	19.5	48	36.5	73	51	73	51
21	75	57	68	53.5	70	58	69.5	53.5	48	37.5	31	2	23.5	15	44.5	30	44	31.5	51	34.5	75	53	72	57
22	76	51.5	74	55.5	70	59.5	69.5	56.5	54.5	36.8	32.5	16	31.5	9.5	51	36	43.5	32	67.5	38	58.5	46	58.5	50
23	71	55	79	60.5	68	58	70	51.5	42	35.5	25	17.5	27.5	8	50	38.5	49.5	33	67	40.5	51	37	69	47
24	69.5	55.5	78.5	59	65	56	58.5	47	39	33	22.5	7	23.5	8	40.5	32	34.5	29.5	69.5	43	49	39	82	56
25	72	57.5	87	65	68.5	57.8	49	42.5	40.5	33.5	19.5	7	22	10	34.5	30.5	49	30	50	38.5	52.5	43	77.5	61
26	69	53	71.5	61	61.5	50	44.5	38	38	31	30	16.5	37	21.5	36	29.5	46	39	54	38	56.5	45	72	59
27	81	51	70	57.5	51	43.5	41	37	39	28.5	29	19	37	23.5	36	27.5	44.5	30	53	42	72	46	77	58
28	76.5	63	72	51.5	60	45.5	46.5	34	39.5	30.5	28.5	19	28	9	36.5	26	32	22	56	45	74	50	74	56
29	74	62	74	53.5	58.5	48	39	28.5	37	28.5	26.5	17	40	21	.....	.....	36	20.5	62	49	77	51	82	62
30	75	60	78	57.5	54	44.5	54.5	28.5	32	12.5	26	15.5	36	27	.....	.....	40	29.5	55	43.5	80.5	57	85	63
31	80	63.5	83	62.5	.....	.....	57	42.5	.....	.....	27.5	19	42.5	25	.....	.....	46	33	.....	.....	74	59	.....	.....
Range	46°.5		38°.5		34°.5		41°.5		58°.5		47°.5		52°.5		40°.5		45°.5		45°.5		45°		40°	
Monthly means	70°.4		71°.9		59°.4		47°.3		41°.3		22°.0		22°.3		31°.7		30°.6		43°.5		53°.6		64°.7	

Maximum, minimum, and mean temperatures—Continued.

STATION, OTTAWA, CANADA.

1876. 1877.

Day of month.	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	81.7	54.2	84.1	59	85.7	63.9	55.7	37.7	47.7	39.9	11.6	0.5	12.6	— 4.1	37.9	27.4	36.7	22						
2	72.7	62	90.7	56	71.5	53.9	52.3	37.5	45.1	39.9	29.7	9.9	14.6	— 2.5	43.7	27.8	40.7	23.2						
3	83.7	64.9	89.7	61	74.7	47.6	57.7	43.8	47.7	33.9	25.5	20.1	3.1	— 8.7	39.7	30	41.7	30.7						
4	84.1	65	89.7	71	72.1	49.8	55.7	43.8	45.7	31.7	24.7	19	2.6	— 8.9	33.7	20	(*)	(*)						
5	80.2	59	92.2	66	61.7	41.8	52.1	37.9	43.7	26.4	28.7	9.9	7.6	—18.9	27.7	20								
6	80.7	60.8	97.8	71	70.7	44.6	56.3	36.2	45.1	32.7	34.7	18.1	19.6	- 3.5	40.7	18								
7	78.9	58.8	91.7	70	70.3	48.8	44.7	32.9	47.7	36.7	33.7	18	31.7	11.9	43.7	18.4								
8	93.1	66	87.1	62	70.3	48.8	46.7	30.7	47.7	35.2	18	4.7	24.7	— 3.7	30	7.7								
9	95.9	74.8	93.1	57	65.7	50	44.3	27.4	39.7	33.3	17.6	— 8.1	0.5	—23.9	30.7	7.7								
10	92.7	72.6	95.1	57.6	69.7	45.8	51.7	37.7	39.7	31.7	— 6.5	—19.9	21.1	—10.9	32.7	12.7								
11	86.9	70	97.1	63	77.6	44.2	44.1	31.7	41.7	33.7	4	—15.9	26.7	9.9	37.7	10.7								
12	91.7	66	95.9	66	72.7	45.8	51.1	24.2	45.7	30.7	17.6	— 1	10	—25.9	39.7	9.9								
13	92.7	70	98.5	68	67.7	40.8	42.7	34	41.7	35.7	38.7	16	19	—25.1	23.7	— 0.5								
14	89.7	66	97.7	66	66.7	43.2	34.7	27.4	39.9	30	38.7	25.4	19.6	—13.9	23.7	— 0.5								
15	82.7	62.9	82.9	62.3	63.7	49.5	35.9	24.2	36.7	24.2	35	1.5	9.6	—15.9	30.1	4.7								
16	90.7	63	82.7	54	66.2	42.3	45.7	25.4	39.7	24.2	22	—24.9	12.6	— 5.7	38.7	19								
17	91.7	61	83.1	55.8	60.7	44.3	41.7	32.7	41.7	30	—12	—30	14.6	—10.8	22.1	10.9								
18	90.1	64.8	82.7	54.6	67.7	52	46.7	31.7	38.7	27.4	— 0.5	—16.1	27.1	2.5	19.6	4.7								
19	93.7	66	81.7	61	67.5	55	56.7	25.4	42.7	34.7	9.6	—17.9	29.7	7.7	21.1	3.5								
20	91.7	64.6	78.7	53.5	64.3	54.4	61.7	34.7	41.1	34.7	— 3.5	—16	41.1	12.9	25	3.6								
21	73.7	56.9	72.7	42.8	64.7	51	49.7	44.8	43.7	34.7	5.5	—15.9	19	3	40.7	7.7								
22	73.7	51	81.9	49.6	64.7	53.5	61.7	44.8	39.7	30.7	15	— 2.7	28.7	2.5	45.7	22.2								
23	70.7	56.9	79.5	56	70.3	55	66.7	53	40.9	30.9	15.6	—10.9	18.6	9.9	46.1	23.2								
24	77.7	49.9	82.7	56	72.7	56	57.1	46.8	34.7	26.2	5.6	— 5.7	17.6	— 0.5	40.9	28								
25	72.7	44.4	88.1	54	73.1	56	47.5	38.7	34.7	23	8.6	— 6.7	3.9	—12.9	37.7	28.4								
26	73.7	49.8	75.5	51	59.7	47.9	41.1	34.9	30.1	23.2	15.6	4.7	14.4	— 9.9	37.7	26.9								
27	76.7	50.4	74.7	54	50.7	40.9	39.9	27.3	32.5	17.8	25.7	8.7	31.7	9.9	37.7	17.5								
28	80.7	60.8	76.1	46.8	59.7	40.5	37.1	25.4	29.5	20.2	21.7	4.7	16.6	— 8.9	34.7	11.9								
29	82.7	49.8	79.1	53.4	54.7	41.9	40.7	22	29.5	17	16.6	— 2.6	27.7	10.9										
30	86.7	52	82.7	51	56.1	33.7	47.7	23	11.6	3.5	—18	4.7	32.7	19										
31	86.7	64.4	86.9	51			46.7	32.2			12.6	5.7	33.7	19.4										
Range	51°.5		55°.7		52°		44°.7		44°.2		68°.7		67°.0		46°.6									
Monthly means																								

* No reports received since March 3, 1877.

Maximum, minimum, and mean temperature—Continued.

STATION, PARRY SOUND, CANADA.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	77.3	46.2	80.7	50.1	71.8	57.2	51.8	36	52.8	47.2	11.6	— 6	20	— 8	37.7	32.5	38.7	10.5	51.8	35	38.7	31	84	51.1
2	67.8	55.1	85.7	52.1	63.8	50.1	56.8	32	57.8	46.2	19.8	8.2	17.6	— 0.5	39.7	32	39.5	28.8	40.2	15.5	46.2	26.8	74	61.2
3	73.8	62.2	83.7	57.7	67	47.2	54	44.2	52.8	36.2	24.8	12	2.2	—16.2	39.7	24.8	32.3	17.5	33.8	5.5	48.3	23.3	67	53.1
4	72.8	52.1	84.7	65.2	63.8	49.1	48	37	44.7	35	25.8	8.2	8.2	—21.4	31.3	22.4	23.8	3.5	46.7	17.8	46.8	29.3	59.8	47.1
5	75.8	51.1	87	64.7	64	38	44.7	30.3	46.2	36.1	35.5	8.2	24.3	6.2	33.8	24.8	20.8	— 7	40	31	55	22.8	70.8	40.2
6	76	54.1	85.7	68.1	68	40.2	53	39.2	43.2	34	41.2	29	28.8	12.5	36	29.8	22	—16.2	43	25.8	62	30	77.8	46.2
7	76.3	54.1	76	65.2	68.8	55	43	32	42.7	33	41	12.5	34.8	10.5	37.7	14.5	24.8	3.7	44.2	17.5	58.8	40.2	78	46.2
8	80.7	64.2	78.7	54.1	67.3	52.1	41.2	27.8	41	31	21.8	8.2	14	—19.2	23.8	— 3	18.6	9.2	54.3	18.7	56.2	34	83	56.1
9	88.7	63.2	84.7	51.1	68.8	51	52.8	26.3	38	28.8	21.8	—18.7	11.1	—19.7	34	2.2	18.6	5.2	54.3	30	55.8	34.6	70.8	54.1
10	81.7	67.2	88.7	52.8	68.8	46.2	54	31	40.7	25.8	1.2	—30.4	24	5.2	39	24	17.8	—12	57.2	27.3	55.3	41.2	57	43.2
11	83.7	59.2	89	62.7	70.8	41.2	42.7	27	42.2	30	16.6	— 5	28	—14.2	43.7	21.3	28	7.2	54.5	31	57.6	41.2	71.8	40.2
12	83.7	59.2	85	68	59.8	42.2	47.8	36.1	47	30	30.8	13.5	— 6.2	—30.4	38.8	5.2	29.8	3.7	49	28.8	61.8	33	70	48.1
13	83	63	88.2	67.2	65	41.2	47.3	36.1	47.8	31	39.2	26.8	22.8	—21.4	1.6	— 3	33.8	3.2	50.8	22.2	64	31.8	64	46.2
14	80.2	59.2	89	67	64.8	45.7	43.7	21.8	43.7	26.8	38.7	15.5	24.8	— 6.5	28.3	— 8	33.8	13.5	51	22.8	66.3	32	72	43.2
15	80.7	57.2	75	54.1	65.8	42.2	41.7	18.5	35.8	18.5	22.8	— 9	19.4	— 3	34	15.5	24	9.2	52	23.8	72.3	37.1	82	47.2
16	80	54.1	73.8	47.1	66.8	37.1	45.7	28.8	38.7	26.8	19.6	—21.4	17.6	— 3	35.3	15.5	16.8	—10	57	26.8	75.8	51.1	68	53.1
17	87	56.1	74.8	57.7	64.8	41.2	43.7	23.8	41.2	34	0.8	—30.4	26.8	— 5.5	18.6	1.2	10.6	—19.2	58	26.8	71.3	51.1	69.8	43.2
18	83.7	66.7	77.2	56.1	64.8	50	48	20.8	41.7	35	3.2	—10	28.8	17.5	23.8	— 7	22	— 7	62	32	68	53.1	80.7	46.2
19	87	64.2	75.8	60.5	64.8	49.6	60.8	28.6	45.7	39.2	7.2	—17.2	32.3	7.2	27.3	3.2	20	—14.2	54.8	38.1	68.8	47.1	64.8	48.1
20	77.7	66	67.8	48.1	73.8	45.2	63.8	43.2	45	37.2	5.2	—26.5	37.2	4.2	30.5	1.5	28.8	4.2	52.3	36.1	76.8	55.1	72.8	40.2
21	70.8	51.1	67.8	43.2	70.8	52.1	68.8	51.1	43.2	35	15.6	1	17.6	3.2	40	11.5	36.8	19.5	62.8	34.1	73.3	53.1	60.8	54.1
22	60	49.1	73	48	70.8	50.6	59.8	42.2	43	35.5	21.3	5.2	25.8	9.2	45.7	22.3	34	20.8	64	26.8	64.2	48.1	65	45.2
23	70	46	79.7	60.2	64.8	55.6	60	44.2	41.7	28.8	12.6	— 1	16.6	0.2	38.2	24.8	34.3	14.5	71	31	49.3	34	68.3	39.2
24	66	47.7	81	59.2	71.3	54.6	48.8	40.2	42	22.8	10	—17.2	16.6	2.2	42	22.8	33.8	1.7	56.8	36.1	51.2	32	75.8	47.2
25	64.8	42.2	71.8	58.2	68.3	51.1	43.7	34	41.7	27.8	18	—15.2	11.6	— 1	34	15	32.8	21.8	48.8	25.8	61.8	43.2	72.8	55
26	68.8	42.2	64.1	54	59	43	39.7	29	41.2	25.6	25.8	15.5	22.8	9	35.8	18.5	38	30.6	54	24.8	67.3	38.1	77.8	54.1
27	76	47.2	65.3	52.1	49.8	40.2	37	23.8	34	23.8	26.8	19.5	30.3	2.2	31.8	14.5	34.8	25.8	54.2	32	68.8	37.6	78.8	52.1
28	68	57.7	70.8	45.2	56	45.2	43.7	25.8	29	15.5	24.8	— 1	34.8	0.5	32.8	5.2	30.8	17.5	43	31.8	72	39.2	74	52.1
29	75.8	54.1	76.7	49.1	53	42.2	43.7	24.8	26.6	8.2	15.6	— 6	37.7	13.5	.....	.....	38.7	14	44.7	37.1	74	41.7	72	50
30	80.5	52.1	79.9	51.1	53	41.2	47.8	25.8	13.6	— 5	11.6	0.2	34	24.8	.....	.....	38.7	15.5	41.7	34	77.8	46.4	81	49.1
31	83.7	51.1	80.7	59.2	.....	.....	53.6	43.2	.....	.....	14.6	— 1	39	24.6	.....	.....	41	22.8	.....	.....	79.9	50.1	.....	.....
Range	46°.5		45°.8		36°.7		50°.3		52°.8		71°.6		60°.4		53°.7		60°.2		66°.5		57°.1		44°.8	
Monthly means	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

Maximum, minimum, and mean temperatures—Continued.

STATION, PEMBINA, DAK.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	81	46	81	65	67	40	76	24	38	29	0	—34	— 9	—29	18	— 2	31	5	20	— 7	60	27	61	48
2	76	57	83	52	73	38	66	33	34	28	10	—10	— 4	—28	24	— 3	9	— 6	19	—14	57	36	50	42
3	75	54	80	62	62	45	38	18	36	19	7	—14	8	—23	32	8	19	—14	34	9	63	30	56	40
4	76	49	85	53	67.5	37	39	19	25	2	18.5	— 5	17	— 4	35	12	8	—10	25	— 5	64	35	73	50
5	79	47	79	63	60	47	39	24	23.5	6	35	10	22	1	36	8	15	—16	30	1	59	46	78	44
6	79	59	82	52	63	46	41	27	30.5	6	24	— 9	15	— 8	34	14	10	—15	23	— 5	51	36	71	51
7	93	61	84	56	61	44	38	20	39	10	— 1	—17	— 6	—25	30	8	6	—22	32	90	65	34	74	49
8	92	64	94	65	56	35	45	15	60	22	— 1	—43	—12	—29	28	5	4.5	—16	32.5	— 4	69	34	55	33
9	77	55	89	70	60	45	50	24	52	20	— 5	—49	— 2	—24	35	15	12.5	—12	39	— 2	75	42	63	33
10	82	48	70	55	61	44.5	39	23	64	12	14	—14	— 5.5	—23	23	2.5	19	— 6	52	28	74	44	69	43
11	81	54	76	49	70	46	55	18	32	17	34.5	8	—15	—33	2.5	—10.5	21	—15	49	30	71	46	70	45
12	78	55	69	59	69.5	35.5	38	22	17	11	35	10	—11	—29	15.5	—24	25	— 4	52	26	78	45	67	46
13	81	52	60	51	68	43	33	25	11	— 8	31	—10	— 1	—47	28	13	30	6.5	57	34	74	42	53	41
14	83	55	70	42	70	35.5	41	6	15	—15	4	—26	—30	—53	33	15	23	—10	56	36	67.5	57	60	38
15	78	60	64	44	69	38	48	16	14	7	16	—22	—22	—53	26	10	20	—12	44	34	72	53	68	34
16	85	65	73	44.5	66.5	52	62	23	18	6	—18	—38	— 7	—43	10	— 8	5	—19	50	30	79	44	75	50
17	77	59	73.5	46.5	76	48	66	29	35	15	— 1	—28	— 7	—22	37	1	16	—11	61	30	69	43	83	51
18	85	52	83	59.5	69	41	67	35	52	— 8	7	—24	— 1	—31	37	17	9	—13	61	29	65	37	65	47
19	72	58	65	48	75	39	59	40	28	—10	—11	—28	1	—15	35	7	24	— 4	72	30	74	48	56	41.5
20	68	51	75	40.5	73	45	56	46	28	3	— 2	—26	— 9	—31	42	20	29	3	67	32	73	57	67	50
21	65	50	72.5	57	71.5	39	48	36	9	— 7	—11	—33	1	—16	40	24	16	— 1	70	41	60	46	73	48
22	70	45	75.5	66	71	50.5	42	31	16	6	—11	—27	— 1	—27	33.5	2	10	— 5	57	45	71	46	72	45
23	74	45	70	60	71	42	40	26	16	8.5	0	—16	13	— 9	24	— 8	24	—14	43	27.5	76	41	83	59
24	77	47	61	46	65	47	37	33	26.5	11	2	—12	9	—17	22	— 3	23	—14	61	24	80	40	67	55
25	78	54	63	42	60	34	35	19	24	8	—10	—30	19	— 9	25	10	35	2	46	29.5	80	45	74	47
26	75	60	68	36	62.5	27	38	11	27.5	9	2	—23	31	4	28	— 3	32	15.5	53	23	77	50	68	54
27	83	52	83	48.5	72	37	50	23	10	—14	— 1	—22	32	8	34	— 1	38	3	58	27	71	57	68	50
28	85	59	78	48.5	50	37	55	26	1	—10	— 1	—18	40	22	37	7	45	11	51	24.5	81	56	76	54
29	85	59	78	57	42	31	61.5	35	1	—19	—13	—32	31	8.5	.....	.....	40	27	56	22	79	61	67	56
30	87	60	77	53	47	32	57	32	—12	—34	— 5	—37	29	8	.....	.....	38	32	65	28	77	53	70	56
31	86	69	66	48	.....	.....	53	27	.....	.....	— 5	—17	26.5	1	.....	.....	36	20	.....	.....	72	47	.....	.....
Range	48°		58°		49°		70°		98°		84°		93°		66°		67°		86°		54°		50°	
Monthly means	67°.4		63°.7		51°.9		37°.1		15°.4		—6°.3		—5°.2		17°.4		8°.3		33°.1		56°.8		55°.7	

Maximum, minimum, and mean temperatures—Continued.

STATION, PHILADELPHIA, PA.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	88	72	76	64	88	70	59	47	72	49	25	17	23	15	50	38	50	33	57	40	55	44	87	63
2	93	76	72	58	75	64	61	47	77	54	28	18	25	16	46	38	55	35	56	37	53	41	88	64
3	92	77	71	60	73	58	66	46	66	47	32	26	19	8	45	35	53	43	50	30	56	41	88	66
4	91	74	78	66	81	59	61	52	54	44	32	25	18	9	43	36	54	31	46	38	63	45	83	69
5	91	73	82	68	69	58	54	49	52	43	33	23	28	12	41	31	37	27	44	36	63	44	78	67
6	86	73	88	70	72	54	75	51	54	38	38	24	33	12	40	32	36	25	57	39	60	46	75	65
7	88	72	91	72	65	59	59	46	54	46	43	28	44	33	47	30	51	33	58	41	66	45	72	64
8	97.5	74	89	75	81	64	58	40	50	41	40	31	45	24	40	32	62	33	51	32	57	49	81	63
9	100	82	90	71	75	63	53	40	51	42	36	6	24	12	37	26	58	27	47	37	55	46	81	67
10	95	71	87	68	65	58	66	44	45	39	17	4	26	15	43	28	29	21	56	37	55	45	78	63
11	93	73	86	68	62	55	59	40	48	38	28	15	35	20	50	31	38	25	63	40	57	45	68	58
12	93	74	85	69	66	58	52	36	51	38	35	20	36	21	56	29	49	34	60	39	64	45	71	58
13	93	75	82	71	74	58	60	40	65	40	49	29	35	20	29	18	43	38	47	35	72	49	81	62
14	89	74	84	71	74	60	68	44	63	46	49	38	31	23	37	16	40	35	50	36	73	51	83	66
15	92	76	88	71	75	61	44	32	46	40	43	24	33	24	43	29	39	23	62	37	79	55	87	70
16	88	73	88	74	65	59	50	31	43	39	35	9	49	32	50	32	37	29	65	40	85	61	77	71
17	88	72	83	72	74	52	58	40	49	37	21	7	34	24	44	28	34	21	71	45	87	65	80	70
18	88	73	80	68	73	63	57	38	51	43	31	13	36	26	40	23	23	15	50	45	90	65	84	66
19	92	74	78	69	74	61	63	40	49	45	25	11	42	33	36	22	25	15	56	42	89	74	90	67
20	95	73	84	64	72	59	60	45	49	43	20	13	44	34	34	21	34	15	60	47	90	70	79	62
21	85	72	74	56	68	58	64	54	50	42	25	15	39	26	50	29	55	28	51	42	80	60	84	60
22	84	68	79	60	60	57	64	58	53	44	33	15	28	22	60	34	49	41	69	43	82	59	72	59
23	80	66	82	66	64	57	68	56	46	38	31	23	31	24	50	32	64	41	75	46	70	56	71	54
24	74	60	84	64	64	60	63	51	41	35	23	17	28	13	37	25	67	43	80	53	58	45	80	56
25	77	61	84	69	69	58	52	41	47	33	23	17	25	14	43	35	47	39	67	52	61	46	86	68
26	76	62	79	68	67	55	50	38	42	35	32	22	37	19	39	33	48	39	64	46	67	50	93	69
27	81	62	75	62	62	47	49	40	38	31	32	24	47	25	41	32	51	35	57	49	68	51	76	63
28	85	65	78	60	64	46	46	39	42	31	25	19	39	30	46	33	35	30	53	47	75	51	69	61
29	85	70	81	64	70	52	52	40	41	32	39	23	44	28	.....	.....	36	29	60	46	81	54	78	62
30	75	66	85	69	61	51	58	38	34	23	31	22	41	30	.....	.....	51	34	63	48	80	57	83	62
31	69	63	84	68	.....	.....	55	48	.....	.....	26	17	41	33	.....	.....	52	34	.....	.....	85	62	.....	.....
Range	40°		35°		42°		44°		54°		45°		41°		44°		52°		50°		49°		39°	
Monthly means	78°.6		74°.3		63°.8		50°.8		45°.0		25°.5		28°.4		36°.9		38°.2		50°.0		60°.7		71°.7	

Maximum, minimum, and mean temperatures—Continued.

STATION, PIKE'S PEAK, COLO.

Day of month.	1876. July.		August.		September.		October.		November.		December.		1877. January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	37	18	50	36	40	31	30	17	11	3	18	10	13	1	17.5	7	7	— 3	13	3	21.5	13	25	13
2	51	34	46	34	44	31	33	19	8	0	19	10	4	— 5	14	5	13.5	— 5	17	5	22.5	11	30	12
3	48.5	38	52	35	51	33	32.5	21	12	5	13	3	12	— 7	18	4	12	5.5	14	3	12	5	29	20
4	55	36	50	35	47	32	27	16	13	0	20	— 1	12	4	9	— 0.5	10.5	— 2	21	3	19	3	27	19
5	53.5	33	46	31	43	30	40.5	21	10.5	1	24	13	15	3	10	— 2	11	— 2	26	7	15.5	7	34	22
6	59	37	54	31	45	30	41	28	13	2	20	14	14	7	8	— 5	17	7	23	10	16	1	27	22
7	58	35	48	33	43	27	41	26	21	2	14	— 1	7	—10	3	— 3	10	— 2	17	8	25	8	27	16
8	47	31	46	35	39	26	39	26	28	17	10	— 1	6	—14	1	— 8	1	—10	16	7	24.5	12	16	10
9	49	28	47	34	39	23	37	26	32	24	16	4	14	3	13	— 2	12.5	0	19	5	27	14	25	10
10	55	33	48	28	43	25	35	23	29	21	22	11	17	—11	15	5	16.5	9	16	4	27	13	34	20
11	55	36	54	32	44	27	34	23	26	14	27	21	14	5	11	5.3	15.5	8	12	3	29	15	25	19
12	54	38	56	36	43	28	32	23	19	2	22.5	15	10	1	14	6	16	6	18	1	24	11	36	21
13	54	36	54	37	37	23	31	23	9	0	15	5	14	0	12	5	23	8	21	7	24	15	36	26
14	50	33	46	34	39	20	26	17	20	7	9	1	13	2	14	5.6	26	15	19	9	22	10	38	27
15	48	33	49	34	43	26	32	16	30	16	17	9	2	—10	14	5	27	16	22	10	34	10	39	27
16	45	36	58	36	37	24	24	17	20	10	20	10	6.5	—15	14	— 2	19	5	23	9.5	25	14	40	29
17	43	34	54	38	37	23	24	17	11	2	13	3	5.5	— 2	19	7	20	5	16	1	24	10	40	29
18	48	33	46	33	31	24	20	14	22	2	17	5	10	— 2	17	5	23	11	9.5	4	21	10	39	28
19	43	35	39	32	31	16	17	2	22.5	15	17	6	10	— 3	16	5	24.5	11.5	17.5	2	21	10	38	28
20	43	33	39	33	41	15	10	0	15	— 2	7.5	1	4	— 2	17	4	16.5	2	21.5	9	25	13	43	28
21	46	34	45	31	43	30	7	— 2	6	— 2	3	— 5	2	— 8	15	0	25.5	8	17	4	30	16	42	29
22	50	35.5	39	27	39	27	22	1	7	— 8	0	— 8	— 2.5	—11.5	10	— 3	22.5	14	13	1	33	19	43	29
23	49	36	43	23	41	25	21.5	15	16.5	3	— 2	—20	6.5	—12	22	7	14.5	2	12.5	— 4	35	20	37	25
24	48	35	46	27	42	26	23	12	13	6	—10	—21	12	5	19	7	15	4	17	8	32	21	37	20
25	49	34	47	28	43	28	31	18	17	7	— 9	—18	12	4	16	6	28.5	10	22	11	29	21	37	24
26	49	32.5	47	31	41	27	33	19	18	12	— 4	—14	11	4	15	6	31	16	13	— 1	33	20	35	27
27	56	35	45	30	35	26	30	16	13	5	— 5	—14	14.5	2	14	1	29	18	2	— 3	35	23	39	26
28	58	39	45	29	31	24	29	15	5	— 6	—11	—21	16	7	18	1	29.5	15	11	— 2	33	20	40	30
29	59.5	38	45	30	33	23	23	12.5	— 1	—17	2	—18	18	7	.....	.....	22	15	5.5	— 8	29	19	39	28
30	56	41	50	32	23	6	21	7	13	— 1	7	— 8	14	2	.....	.....	24	4	19	1	21	10	39	24
31	55	36	45	33	.....	.....	19	8	.....	.....	1	—11	20	11	.....	.....	7	— 4	.....	.....	15	8	.....	.....
Range	41°.5		35°		45°		43°		49°		48°		35°		30°		41°		34°		34°		33°	
Monthly means	42°.0		38°.5		31°.7		21°.4		11°.0		4°.9		5°.4		7°.7		12°.1		9°.6		18°.3		28°.1	

Maximum, minimum, and mean temperatures—Continued.

STATION, PITTSBURGH, PA.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	94	69	83	63	88	67	54	42	79	50.5	22	15	21	5	66	46	51	26	68	42	42	37	89	55
2	95	71	82	64	78	56	56	42	74	49.5	29	15	18	13	58	42	57	40	69	32	51	36	87	60
3	88	70	91	69.5	77	46.5	69	42	53	43	31	25	15	11	46	36	51	37	46	25	59	33	81	63
4	91	70	93	68	77	60	49	40.5	50	40	30	24	19	10	47	32	47	24	61	38	62	38	84	60
5	90	70	96.5	71	67	49	54	42	58	40	33	24	34	9	51	32	34	23	52	42	65	41	87	64
6	87	67	95	71.5	71	49	65	50	50	44	36	20	42	18	39	31	39	19	56	41	61	46	71	60
7	91	72	87	71	80	60	50	39	48	40	39	29	39	31	39	33	50	36	62	33	68	43	77	58
8	97	72	86	68.5	79	71	52	38	44	38.5	36	18	37	11	41	29	58	40	59	39	52	46	87	58
9	101	75	90	60	77	62	54	32	40	37.5	18	— 4	15	9	41	24	57	16	57	41	57	41	80	70
10	99	75	90	65.5	66	56.5	62	43.5	45	33	17	— 6	27	4	50	24	27	10	64	39	56	39	72	54
11	97	71	89	71	71	62	46	34	40	35	33	17	42	26	60	28	44	20	64	35	62	41	76	47
12	93	73	83	69.5	66	60	56	29.5	58	30	38	33	38	27	48	22	42	34	61	34	67	39	80	55
13	88	71	90	70	69	57	63	34	65	44	51	34	35	14	34	15	40	31	56	38	73	47	86	56
14	86	71	89	67	78	60.5	56	37	61	45	39	29	28	17	44	16	47	28	60	34	78	49	87	65
15	86	67	92	68	65	55	38	30	46	40	33	13	50	29	44	25	34	19	65	34	85	49	84	66
16	91	59	88	67	68	51	50	28	43	37	32	5	50	28	44	29	30	25	70	39	85	64	85	67
17	95	69	78	69	59	55	58	43	51	33	26	4	33	25	33	23	27	13	72	48	86	65	85	68
18	93	75	90	64	59	55	55	31	54	43.5	34	11	37	20	41	21	27	2	60	54	91	64	90	61
19	97	74	90	72.5	73	56	69	33	51.5	45	22	10	39	29	39	23	23	12	76	56	93	66	87	69
20	97	71	80	61	75	54	74.5	45	48	43	21	7	46	21	39	19	41	9	58	42	91	66	83	61
21	81	67	77	50	80	60	80	58	47	43	38	18	27	19	56	30	51	35	61	40	85	68	88	68
22	88	60.5	82	50	66	59	78	52.5	45	37	33	17	35	23	59	35	52	32	73	38	75	58	70	54
23	74	61	74	65	72	59	71	51	40	32	28	19	28	18	54	39	67	34	76	40	63	49	78	48
24	74	54	89	64.5	72	61	57	43	35	26	20	17	24	17	41	34	51	36	80	43	52	42	87	63
25	75	57	90	68	69	62	45	38	39	30	29	17	29	12	41	32	64	42	62	44	61	40	87	67
26	79	53.5	79	60	63	47	44	39	37	33	30	25	44	23	40	28	52	33	63	40	70	42	90	65
27	87	57	76	50.5	59	44.5	51	35	36	31	26	21	45	32	37	28	38	32	61	51	77	43	86	69
28	75	65	77	49	65	44	61.5	38.5	39	29	30	19	45	30	43	29	37	29	71	50	77	46	84	65
29	84	65.5	81	55	62	51	59	49	36	24	28	22	51	38	.....	.....	41	28	70	51	83	50	85	64
30	77	64.5	78	62	57	46.5	62.5	47.5	29	22	24	19	51	30	.....	.....	54	28	52	40	83	57	88	66
31	77	62	90	63	.....	.....	79	52	.....	.....	20	9	53	31	.....	.....	50	38	.....	.....	86	55	.....	.....
Range	47°.5		47°.5		44°		52°		57°		57°		49°		51°		65°		55°		60°		43°	
Monthly means	76°.1		73°.7		62°.3		49°.1		42°.4		23°.6		28°.1		36°.9		35°.7		51°.7		60°.1		72°.1	

Maximum, minimum, and mean temperatures—Continued.

STATION, PORT DOVER, CANADA.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	66.1	53.7	89.9	59.8	77.8	59.8	52.8	37	54.8	49.7	7.1	4.6	18.1	12.8	43.9	31	38.9	20	49.8	37	40.9	34	88.9	52.7
2	83.8	61.8	88.9	60.8	67.7	50.7	55.8	44	55.8	49.7	25	17	15.1	11.8	39.9	30	44.9	35	48.1	22	49.8	31	71.7	59.8
3	76.7	63.8	81.8	65.8	69.7	46	52.8	48.7	51.1	41	28	20	14.1	8.8	39.9	32	39.9	33	38.9	17	56.8	33	71.7	57.8
4	71.1	61.8	87.8	67.8	69.7	51.7	48.8	41.9	46.9	38	30	16	15.1	3.6	35	24	33	21	50.1	26	51.1	34	71.7	55.7
5	78.8	57.8	91.9	68.8	65.8	45	52.1	41.9	48.8	34	31	18	25	12.8	27	16	25	17	38	33	56.8	36	64.8	49.7
6	76.7	56.8	81.8	69.8	66.1	44	55.8	45.9	46.9	41.9	35	31	33	23	33	27	31	7.8	47.9	30	61.8	39	72.1	52.7
7	87.8	62.8	83.8	67.8	69.1	58.8	45.9	38	41.9	39	32	24	32	27	39.9	27	31	15	43.9	27	59.8	35	67.8	52.7
8	90.9	68.8	79.8	54.7	72.7	56.7	43.9	31	41.9	37	24	13	27	7.8	28	17	38.9	20	39.9	31	59.8	38	80.8	51.7
9	82.8	71.8	90.2	60.8	68.7	48.7	50.1	25	43.9	35	13.1	2.6	10.1	2.6	33	16	32	12.8	49.1	34	53.8	43	68.8	59.8
10	81.8	71.8	89.1	59.8	59.1	55.7	50.1	36	39.9	30	13	— 2.6	20.1	9.8	36	20	18.1	6.6	54.8	34	50.8	38	59.8	49.7
11	81.8	68.8	86.8	63.8	58.8	54.7	42.9	30	40.9	33	30	8.8	32	19	39.9	25	34	17	58.1	36	55.1	42	72.1	46
12	84	68.8	80.8	70.8	65.8	48.7	46.9	25	47.8	29	33	27	19.1	— 7.8	38.9	16	32	24	52.8	36	61.8	37	64.1	53.7
13	80.8	72.8	90.2	67.8	70.1	45	50.8	35	48.1	33	39.9	33	15	— 0.6	26	10.8	34	19	49.8	31	71.7	39	74.1	56.7
14	80.8	68.8	88.9	68.8	69.7	50.7	48.1	28	46.9	34	36	21	19.1	12.8	32	8.8	33	19	52.8	32	75.1	41	76.1	58.8
15	80.8	59.8	84.8	63.8	68.7	53.7	37.9	22	37.9	30	30	9.8	23	13.8	32	15	25	10.8	52.1	31	74.7	43	68.7	59.8
16	83.8	57.7	75.7	56.7	71.1	46	48.1	32	39.9	33	30	— 3.7	22	12.8	37	24	27	10.8	56.8	37	72.1	55.7	74.1	59.8
17	87.9	56.7	83.8	61.8	53.1	49.7	50.8	33	40.9	37	10.1	— 3.8	23	3.6	24	17	16	— 1.6	59.8	39	56.7	54.7	68.1	49.7
18	82.8	72.1	81.8	60.8	60.1	50.7	50.1	24	48.1	39	14.1	6.6	30	6.6	26	15	19	3.6	49.8	44.9	82.8	58.8	74.7	41.7
19	92.9	65.8	81.8	63.8	65.1	54.7	57.8	27	47.8	43.9	15	2.6	34	26	25	11.8	25	— 0.6	47.8	39	77.8	58.8	78.8	58.8
20	83.8	59.8	72.7	55.7	70.7	52.7	68.7	39	43.9	39	12.1	— 4.4	36	9.8	31	11.8	27	— 1.4	48.8	37	81.8	57.8	78.8	49.7
21	81	54.7	71.7	46	69.7	53.7	60.8	53.7	42.9	38	20.1	10.8	14.1	5.6	40.9	28	35	25	62.8	38	68.7	56.8	69.7	52.7
22	71.7	52.7	74.7	47	65.8	54.7	59.8	63.7	38.9	35	27	20.0	20.1	12.8	41.9	30	38	29	54.8	41	63.8	52.7	68.7	47.7
23	71.7	56.7	73.7	60.8	63.8	56.7	59.1	48.7	36	31	20.1	16	17.1	8.6	38	31	38.9	29	61.8	37	54.1	41.9	74.1	42
24	71.7	48.7	79.8	60.8	62.8	57.8	49.1	39.9	36	28	16	1.4	15.1	8.8	39.9	33	29	24	65.8	42	55.8	34	74.1	51.7
25	70.7	49.7	78.8	58.8	66.8	57.8	41.9	36	33	30	21.1	7.8	19.1	6.6	37	30	37	26	47.8	37	62.8	43	72.7	62.8
26	73.7	47.7	71.7	50.7	60.8	44	39.0	35	32	28	21.1	15	32	17	37	24	37	34	63.8	33	57.7	43	69.7	59.8
27	77.8	52.7	73.7	47	52.8	42	42.9	32	33	28	20.1	15.1	33	27	35	27	37	31	56.8	42	64.8	47	76.7	56.7
28	79.8	62.8	72.7	45	58.1	44	38.9	32	33	29	21.1	8.8	34	25	39.9	22	31	24	52.1	40	64.8	46	81.8	57.8
29	79.8	54.7	73.7	57.8	58.1	48.1	42.9	34	31	24	22.1	10.8	34	25	.....	.....	36	21	55.8	40	74.7	47	67.8	55.7
30	82	59.8	75.7	62.8	53.7	41	59.8	34	26	10.8	17.1	10.8	32	17	.....	.....	39.9	28	45.9	38	71.7	50.7	75.1	61.8
31	84	60.8	79	61.8	.....	.....	61.8	44.9	.....	.....	20.1	16	39.9	22	.....	.....	38.9	33	.....	.....	75.7	51.7	.....	.....
Range	45°.2		46°.9		36°.8		46°.7		45°.0		44°.3		47°.7		35°.1		46°.5		48°.8		51°.8		47°.2	
Monthly means	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures--Continued.

STATION, PORT HURON, MICH.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	64	58	77	63	73	57	50	39	64	49	21	10	21	11	45	34	42	22	63	36	38	31	83	60
2	79	60	77	60	60	50	60	41	63	41	27	20	23	13	39	30	49	33	36	21	41	29	81	65
3	88	66	74	65	70	48	53	42	45	38	30	24	16	4	33	31	35	28	34	16	57	33	75	63
4	76	62	83	63	63	52	48	38	45	39	30	19	16	4	31	25	29	13	50	26	50	36	67	53
5	78	63	82	68	61	46	50	35	51	40	32	15	20	10	33	21	24	11	42	31	53	33	59	49
6	80	62	82	67	63	48	53	42	50	36	35	24	35	16	35	32	34	7	51	29	45	33	63	47
7	88	68	73	65	71	57	46	36	42	36	27	21	31	17	40	31	35	13	34	25	42	32	73	45
8	90	73	83	58	71	60	46	33	39	32	22	8	17	9	34	22	26	16	40	28	45	34	79	55
9	89	74	83	61	63	53	51	27	39	31	8	0	10	3	36	23	22	9	48	33	43	36	70	52
10	80	62	87	61	60	54	51	34	38	26	12	— 7	21	9	45	24	20	0	44	31	45	36	57	46
11	79	62	82	70	62	55	43	27	43	28	26	0	26	12	46	32	33	9	40	31	50	36	67	46
12	87	68	81	69	61	56	47	29	56	36	35	25	12	— 2	43	19	32	22	38	30	52	35	88	49
13	75	69	83	68	61	44	55	34	60	40	40	34	16	— 1	22	15	35	15	40	27	58	36	76	55
14	70	66	85	68	65	52	47	28	40	30	36	17	19	11	37	14	34	16	41	28	67	38	74	54
15	68	60	74	61	62	50	38	25	38	34	29	6	23	13	38	23	29	6	52	30	67	49	80	63
16	77	60	72	57	64	50	51	27	37	31	29	— 6	23	11	37	23	26	8	63	42	75	56	68	54
17	85	62	82	63	62	51	47	35	40	35	10	— 7	24	4	27	15	17	— 2	44	34	78	60	65	50
18	86	70	80	64	57	53	58	26	45	38	20	8	29	6	37	18	24	7	48	36	84	56	82	53
19	86	68	72	64	75	50	63	41	49	45	15	5	35	24	32	18	20	5	43	35	85	47	72	52
20	84	66	68	58	75	57	66	49	45	41	16	0	36	9	40	14	28	8	50	34	83	59	77	50
21	66	57	74	47	65	55	71	55	45	39	23	10	15	— 3	52	30	37	22	51	42	75	60	76	52
22	77	53	75	53	68	57	64	52	43	31	23	17	25	11	48	35	45	29	69	46	61	45	54	48
23	63	53	76	59	62	58	58	43	33	30	21	9	16	3	41	29	43	21	73	49	51	40	70	37
24	67	50	85	65	63	56	47	38	31	26	16	7	17	11	34	29	26	16	59	35	45	37	78	57
25	69	51	77	59	72	52	42	36	33	28	21	10	20	4	34	25	28	25	43	31	47	41	79	61
26	73	50	71	52	55	45	38	34	37	28	21	15	33	12	29	23	32	25	50	29	53	44	72	58
27	79	61	72	47	55	42	42	32	34	30	20	14	32	26	30	22	35	27	42	34	66	46	68	56
28	73	63	78	52	54	40	45	37	35	28	20	13	37	22	41	20	35	22	43	35	72	47	73	59
29	70	59	75	62	55	42	45	38	33	24	23	14	40	23	.....	.....	34	21	53	35	77	51	77	38
30	72	63	76	66	49	38	58	41	28	14	24	7	45	20	.....	.....	44	23	43	35	80	55	81	63
31	75	66	86	67	.....	.....	61	49	.....	.....	20	13	46	29	.....	.....	43	35	.....	.....	81	56	.....	.....
Range	40°		40°		37°		46°		50°		47°		49°		38°		51°		57°		56°		46°	
Monthly means	69°.4		70°.2		57°.4		44°.4		37°.7		17°.9		19°.1		30°.6		24°.7		39°.9		52°.2		63°.2	

Maximum, minimum, and mean temperatures—Continued.

STATION, PORTLAND, ME.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	86	61	83	60	84	62	59	49	53	43	24	13	28	15	42	36	47	27	47	39	59	47	87	65
2	92	63	86	59	73	58	61	44	53	48	33	8	25	13	46	35	43	26	43	38	51	44	72	61
3	89	63	85	60	76	54	62	43	62	47	38	30	18	8	49	32	49	38	52	37	54	40	82	59
4	85	70	82	60	74	58	64	51	55	40	41	30	14	1	47	32	45	29	45	30	56	39	78	63
5	88	69	88	63	63	52	57	47	50	38	38	28	24	1	42	26	35	24	39	35	60	39	76	58
6	84	69	91	69	68	49	57	45	48	32	42	25	26	3	43	34	30	21	49	34	57	41	63	56
7	87	65	95	74	72	49	59	45	51	41	42	29	40	21	44	24	41	19	47	37	59	42	60	53
8	85	64	93	73	64	49	52	38	51	44	38	30	43	30	39	24	40	22	51	35	59	42	58	53
9	78	61	91	66	59	51	54	35	51	44	36	13	40	12	33	13	50	32	55	37	47	41	62	54
10	78	59	88	66	68	48	57	40	50	44	14	1	15	5	38	17	32	22	53	37	48	39	72	57
11	84	68	86	63	73	50	56	40	48	43	10	3	32	9	42	22	34	18	53	39	60	41	69	55
12	88	66	85	64	72	50	52	34	47	44	28	7	25	8	43	31	40	31	45	31	65	41	69	51
13	94	69	82	67	70	49	60	36	50	42	40	24	23	3	33	16	37	27	58	33	70	44	76	57
14	77	67	85	66	67	52	53	44	47	39	42	35	25	5	35	16	36	18	58	34	79	52	85	61
15	86	65	84	68	72	57	45	32	42	35	35	18	13	3	42	26	38	23	60	33	81	62	81	63
16	91	63	82	64	65	51	48	32	43	30	32	— 1	17	9	46	34	32	17	63	39	74	59	81	62
17	91	67	77	64	58	47	48	40	45	33	5	—10	22	5	40	23	27	22	51	40	62	48	79	65
18	97	67	78	64	59	51	52	38	45	34	15	0	29	3	32	12	23	14	56	42	70	46	78	58
19	94	72	77	63	58	51	55	37	43	33	23	6	36	18	26	16	28	13	43	40	81	61	90	60
20	84	69	77	60	57	54	58	37	41	35	15	2	43	31	31	14	37	17	49	41	72	54	79	56
21	85	66	64	53	56	51	52	39	40	35	13	0	32	21	42	20	43	26	52	44	65	46	69	55
22	78	58	73	52	66	50	55	49	43	34	17	8	32	20	43	27	51	41	62	41	56	52	68	55
23	65	58	77	56	70	48	55	51	45	38	26	14	31	17	40	27	51	38	72	43	63	46	74	50
24	78	57	76	55	62	50	61	52	42	34	22	5	23	8	36	32	47.5	33	67	43	59	49	74	57
25	74	57	78	59	62	52	57	42	38	29	29	12	13	1	37	33	40	31	64	45	55	45	87	61
26	68	52	80	66	57	53	52	41	39	23	30	14	26	— 7	42	33	38	34	66	45	61	45	71	60
27	76	51	67	55	60	47	48	37	40	24	35	25	34	18	41	26	47	37	66	47	67	45	78	56
28	76	63	75	51	65	45	44	32	40	26	29	14	26	9	42	22	47	38	58	43	78	47	72	57
29	77	63	74	51	64	50	47	28	37	27	22	12	32	19	.....	.....	44	33	48	42	80	57	75	57
30	77	61	76	56	65	52	54	34	30	16	33	19	41	23	.....	.....	42	29	59	42	81	56	70	54
31	73	61	81	56	.....	.....	53	34	.....	.....	25	17	41	20	.....	.....	54	36	.....	.....	82	58	.....	.....
Range	46°		44°		39°		36°		46°		52°		50°		37°		41°		42°		43°		40°	
Monthly means	71°.6		69°.4		58°.3		47°.1		41°.2		21°.5		20°.1		32°.7		34°.0		45°.8		58°.6		65°.0	

Maximum, minimum, and mean temperatures—Continued.

STATION, PORTLAND, OREG.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	80	59	80	51	90	57	79	54	57	39	52	40	47	37	60	46	52	43	61	45	71	39	66	44
2	81	53	76	52	84	55	73	51	55	36	54	43	48	39	60	47	49	39	65	39	67	44	64	49
3	80	54	81	55	72	53	77	51	48	35	54	42	44	36	48	40	52	38	60	42	66	41	71	56
4	83	55	71	60	66	55	74	51	55	42	51	39	52	39	57	34	52	31	58	44	66	46	65	54
5	76	55	77	50	69	51	74	48	46	36	49	32	55	45	56	31	51	38	58	43	70	52	63	47
6	63	52	83	53	71	50	64	57	47	36	48	32	55	45	47	33	57	42	61	46	61	48	62	48
7	66	52	72	56	65	53	68	57	49	38	45	30	50	37	52	31	54	44	56	44	57	46	71	48
8	66	54	66	48	65	55	66	53	53	35	39	28	50	38	55	39	50	35	52	42	60	48	80	47
9	65	53	68	47	66	50	68	54	49	34	39	27	56	42	48	37	43	34	53	42	62	49	77	55
10	64	53	71	47	67	53	66	52	52	42	36	28	54	39	50	25	47	34	59	42	68	42	66	51
11	67	49	67	53	72	48	67	53	52	42	40	27	42	32	41	33	55	41	64	38	76	45	83	52
12	79	50	69	47	80	56	63	53	49	34	40	32	38	28	52	34	62	48	61	45	79	49	76	47
13	75	58	79	50	74	57	64	54	48	36	46	33	39	27	53	41	64	53	63	36	67	49	77	49
14	70	57	84	60	67	53	72	57	61	41	50	30	44	34	43	34	68	47	68	36	64	45	80	45
15	71	57	75	61	67	55	68	52	60	47	48	26	47	37	49	30	61	49	58	46	76	40	77	48
16	71	57	80	51	71	55	67	55	59	47	41	24	49	39	57	37	61	39	55	44	67	48	74	49
17	74	57	82	58	75	48	63	52	58	46	47	24	49	38	61	37	62	39	58	35	64	43	71	56
18	78	58	71	55	69	52	64	52	63	53	46	24	45	35	62	46	60	42	55	44	69	38	65	54
19	90	57	71	56	64	44	61	48	55	45	39	29	44	31	59	47	61	46	54	41	63	48	68	48
20	85	59	69	54	61	51	65	46	52	41	39	30	42	27	58	48	64	42	57	41	53	41	76	48
21	87	61	64	55	61	50	64	40	54	39	42	27	44	29	60	46	59	48	63	37	57	41	76	49
22	83	60	64	51	64	52	65	52	57	37	45	34	40	30	60	49	59	44	64	37	60	40	66	53
23	76	59	66	51	67	50	58	46	54	45	52	36	42	29	54	42	58	43	68	35	60	49	65	51
24	78	58	79	46	71	50	65	48	62	50	50	39	43	30	52	39	60	53	68	38	67	51	64	52
25	80	56	70	52	81	53	62	48	62	50	54	42	45	33	57	37	61	53	74	40	61	49	64	48
26	78	58	73	45	81	57	62	52	59	45	52	43	50	35	55	37	60	47	78	42	61	45	68	48
27	73	59	66	55	88	58	60	49	52	40	52	42	53	39	52	37	58	45	71	44	65	43	71	50
28	76	58	66	43	88	58	58	48	50	40	56	43	55	37	54	44	57	40	74	42	62	44	66	53
29	76	57	76	43	89	61	54	43	50	35	52	45	56	27	....	.....	61	38	64	47	63	48	63	52
30	72	59	83	51	82	55	54	42	52	41	52	42	58	43	....	.....	61	39	62	45	66	48	68	52
31	71	57	81	56	....	.....	53	43	.....	.....	45	34	57	43	....	.....	59	45	.....	.....	65	48	.....	.....
Range	41°		41°		46°		39°		29°		32°		31°		37°		37°		43°		41°		42°	
Monthly means	66°.5		64°.1		69°.9		57°.6		45°.8		40°.2		42°.0		46°.2		49°.9		52°.6		56°.7		69°.9	

Maximum, minimum, and mean temperatures—Continued.

STATION, PORT STANLEY, CANADA.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	73	54.2	84	57.2	78.2	57.2	54.2	37	59	51.8	17	3.7	22	55	47	28	38.6	18.4	40	39.2	42.8	31	79.8	55.2
2	79.6	63.1	84	57.8	69	47	59.8	44.4	58	46.2	27.6	15	23.8	12.9	42	25.8	42	33.6	42	22	51	30	75	62.1
3	75	63.7	80.2	66	71.4	44.4	57.4	47	50	40.2	32.5	13	25.2	4.9	37.6	28.8	37.4	31.6	35.6	16.2	51.2	26.5	79	59.4
4	77.6	62.7	85.6	62.3	73	47.8	52	40.6	48	34.2	33	16	19	−11.5	32.8	18.4	33.4	17.5	44.8	25	51	31.4	75	55.1
5	80.6	59.2	88.6	65.5	70	41.6	54	41.2	50.8	30.2	31	15.2	22.4	14	29.4	16.5	29	16.6	41	32.4	60	31.8	66	53.2
6	79.8	54.4	83	68.6	76.5	43	57	44	50	39.2	36	17.8	33.4	20.8	33.4	27.6	33	3.1	45	26.5	64.5	41.8	76.5	53.3
7	78.2	63.7	83.8	61.1	70.8	58.2	49.8	37	43.4	38.2	34	21.8	33	23	42	25.5	35.6	13	43.6	25.2	62	35.2	75	48.2
8	81.6	65.4	82	55.2	75	55.2	51	32.2	40.4	35.4	24.2	9	25	5.4	32	12.6	38	19.4	48.8	31	62	37.6	76.2	53.2
9	85	66.9	83.8	56.6	67.5	47.2	53	25.6	45	30	10.1	0.7	11.8	5.9	32.8	11	33.4	11	54.6	34.2	57.8	37.6	73.4	56.7
10	80.4	69.1	86.2	57.6	60.4	54.2	54.4	35.6	40.4	29	16	−4.3	23.8	11	37.8	14.8	21	6.7	58.5	36.5	56	36.2	60.8	48.2
11	80.4	65.3	86	65.7	63.8	54.2	43	26.5	44.6	33.4	31.6	−0.3	32.2	17.5	40	20.8	35.4	18.4	61.6	31.2	55	38	68	44.2
12	86	67.1	84	72.1	68	47.2	50	23	49.2	31.2	35.6	25.6	19	−6.1	40.6	15.4	35	23.1	55	32.2	61	38.6	65.2	53.6
13	88	71.1	84	70.1	69	44	56	27	56.2	32.8	41.6	33.6	16.4	−2.3	27.8	8.9	36.8	13	53.5	32.6	65.6	38.2	71	53.2
14	88.8	64.6	84.6	65.6	70.6	52.8	50.6	27	44	33.2	36.4	18	26	13	28	7.9	36	14	50.4	29.6	74.4	39.4	75.4	59.2
15	93.8	57.2	82.2	60.2	68	50.1	40.6	23	40	29.4	30.4	8.9	23.2	12	33.2	19	29.6	4.7	50.8	28	71.6	42.2	76.2	60.5
16	82.2	55	78	55.2	70.6	41.2	49.6	30	41	33.4	31	−4.8	22	0.1	38.8	23	28.6	8.3	53	34.8	73	42.2	73.8	60.1
17	84	55.2	82	60.5	61	51.2	51.6	32.2	42	37.4	11.2	−3.7	27	−4.3	24.8	11.5	21.6	−5.1	53.2	34	63	53.2	72	52.2
18	89	69.1	82	60.3	60.6	52.2	55	24.8	48	38.4	19	6.9	32.6	−2.5	33.2	10.4	22.6	−3.7	50.3	45.2	70	54.6	77.2	48.2
19	83.8	65	83.8	64	70.6	55	57	27.6	50	43.7	17.2	9.9	34.4	20	33.6	15	27	−8.9	48.6	43.1	79	56.2	75	52.2
20	84.6	62.1	73	51.2	71.4	51.6	66	40.2	45	39.8	17.2	7.9	36.5	8.5	35.2	15	29.5	−8.1	56	39	77	56.8	73	48.2
21	78.6	54.6	74.6	43.2	72	54.6	62.6	51.2	45.2	39.2	28	8.5	15.4	0.9	39.2	29.4	42.5	−16.8	62	34.4	75.6	59.2	76	52.4
22	76.4	51.7	83	47.4	69.2	57.2	60.4	52.4	46	32.6	29.4	18.8	29.4	8.9	41.6	28	40.4	27	60	33.2	67	49.1	70.6	47.2
23	73	52.7	74	60.2	66	57.2	59.4	45.9	38.2	28	21.8	15	17.4	3.9	41	27	38	23.4	58.8	31.4	55	40.8	72	38.2
24	74.2	48.2	81	63.1	66.2	58.2	50.4	37.6	33.5	27.6	16.2	−4.3	18	9.9	43.4	34.2	33.2	21.4	65	40.6	55.8	34.3	76.2	47.2
25	75.6	50	82.8	55.2	70.2	57.6	43.8	37.2	35	29.8	24.1	6.7	24.2	4.9	36	26	38.6	27.1	56	30.4	62	39.2	76	61.6
26	71	48.2	74.6	50.2	60.2	42.2	40.8	34.2	37.4	29	24.1	17	32.4	12	35	22.8	35	30	56.8	29	69	42.7	75	62.1
27	79	53.6	74.5	43.6	56.8	42	46	34.6	35	29.8	23.5	12	37	25	36.6	18	36.6	29.5	62.8	36.4	69.8	44.8	74.2	60
28	83	62.1	77.6	44.4	59.4	40.2	47	35.2	36.2	27.8	23	−2.3	35	24	37	21	33.2	23.5	53.6	42.2	70	41.2	78.2	56.4
29	76.4	54.7	76.2	58.2	60	44.2	47.8	36.2	34.5	22.6	25	16	37.6	12	.....	.....	34.6	21.5	53	41.6	70.2	43.4	77.6	54
30	84	53.2	78.5	62.3	55	40.2	55	38.2	25.4	13.6	22	11.6	37	9.2	.....	.....	39.6	20.5	53	39.2	74	51.6	76.8	54
31	87	57.4	82.6	62.1	.....	.....	63	50.2	.....	.....	21.2	9	41	22.4	.....	.....	44.6	34.1	.....	.....	76	48	.....	.....
Range	45°.6		45°.4		38°.0		43°		46°.6		46°.4		52°.5		39°.1		53°.5		48°.8		52°.5		41°.6	
Monthly means	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, PUNTA RASSA, FLA.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	91.5	75	85.5	77.5	90.5	75.5	81	69	81	64	57	38	69	58.5	76	58.5	76.5	66	79.5	61	75	65.5	83	72
2	91	75	89.5	78.5	90	76	70	58	80.5	67	49	34	54.5	46	76	60	74	61	78	63	76	58	85	70
3	90	75	86.5	75	88	78	77.5	55	80	68.5	52	38	57.5	40.5	76.5	61	73	60	78	63	79	58.5	86	68
4	86	75	86	75	90	72	84.5	69	80.5	69	54	36	61	44	77	62.5	76	66	77.5	68	79	64	85	73
5	84	75	89.5	75.5	86.5	72	87	72	82.5	70	51	38	69	48	76.5	64.5	80.5	66.5	75	66.5	80.5	71.5	86	75
6	83	75	88.5	76	86	73.5	89.5	73.5	76	67.5	61	38	67	63	76	66	72	59.5	79	59	83	67	86	79
7	89	71	90	74	85	73	87	73.5	74	66	59.5	48	64	55.5	73.5	67	76.5	53.5	77.5	63.5	79	74	90	74
8	86	73	89	75.5	89	74	84.5	77.5	69	56.5	63.5	53	67.5	53	67.5	61	76.5	62	77	70	78	71	83	77
9	88	75.5	90	75.5	90.5	74	84	74.5	64	52	62	50	64	59.5	68	60	72	62	75	69.5	73	67	90	78
10	89.5	77.5	88.5	72.5	88.5	75	84	75.5	64	52	69.5	48	71	56	69	58	69	53	71	64.5	77	60	89	77
11	89	75	89.5	75.5	89	77	84.5	75.5	64	49	68	58	78	56.5	68	51	73	50	66.5	56	84	66	(*)	.....
12	90	75	91	73.5	89.5	74.5	85.5	73.5	72	50.5	67	51	78	67.5	74.5	55	77	58	75	55.5	86	68	.....	.....
13	90	76.5	90.5	75.5	82	76	78	74	76	60	72	55	75.5	68.5	76	58.5	71.5	60.5	74.5	67	83	63	.....	.....
14	89.5	67.5	91	75	90.5	74	85	72	77	64	75	61	75	63	73.5	60	74	65	68	58.5	83	70	.....	.....
15	86	67	91	74	91	69.5	83	70	74.5	64	71	65	74	67	72.5	61	68	62	70.5	55.5	81	68	88	78
16	88	74	92	77	83.5	73	80	71	76.5	62.5	70	57.5	76	68.5	73	62.5	75	55	75.5	57.5	80	67	89	78
17	90.5	77	92	76.5	87	78	80	68.5	77	63.5	75	57	78.5	69	63	56	75	62	77.5	58	73	68	92	75
18	87	71.5	87	76	89	76	85	73	78	66	73	62	79.5	69	64	48	72	55.5	77	60.5	81	70	91	73
19	90	73	88	77	86.5	73.5	79	74.5	73.5	68	69	55	80	67	63	52	73.5	51	79	65.5	85	70	89	76
20	91	72.5	84.5	72	88.5	74	79.5	74.5	69	58	73.5	59	76	64	69	57.5	77.5	58	80.5	71.5	85	70	92	79
21	90	72.5	86	79	88	76	80	69	67	54	66.5	60	76	67.5	65	46.5	73	63.5	79	72	83	74	84	78
22	89	74.5	87	76.5	90	72.5	82.5	57	71	53	71	61.5	79	68.5	68	51.5	68	57.5	83	69	85	75	88	76
23	88.5	75.5	88	74.5	88	73	79.5	69.5	75.5	59	73.5	64.5	78	69	66	60	71	52	78.5	61	85	75	86	78
24	88.5	72	89	75.5	87	75	71	63	77	60	72.5	66.5	72	59	66	59	76	57.5	80.0	61	85	77	90	80
25	88.5	74	87	75	87	75	76	60	73	58.5	73	68.5	69	47.5	64.5	55	73	64.5	78	61	85	74	89	78
26	89.5	75	88	74.5	90.5	75	74.5	63	63	49	73	68.5	74	55.5	65.5	54.5	66	59.5	79.5	62.5	84	73	92	78
27	88	70	86	74	88	73.5	75.5	58	67	48	75	69	71.5	60	74	60	66.5	59.5	80	65	84	70	93	79
28	86	72	87	73.5	86	73	77	62	71	58	75	69	67.5	55.5	76.5	65.5	71	63	81	71	80	68	91	77
29	79.5	71	88.5	75	84.5	70	78	61	74.5	60	71.5	59	73.5	52	.....	.....	73	64.5	78.5	67	80	67	90	80
30	87	73	89.5	73.5	87	73	79	65	70	56	59.5	44	75	59	.....	.....	77	57	80.5	68.5	84	70	90	73
31	82.5	71	90	74.5	.....	.....	80.5	64.5	.....	.....	62	39	75	59	.....	.....	78	61	.....	.....	84	72	.....	.....
Range	24°.5		20°		21°		34°.5		34°.5		41°		39°.5		30°.5		30°.5		27°.5		32°		.....	
Monthly means	80°.6		81°.6		81°.1		75°		66°.9		60°.2		65°.8		64°.8		67°.1		71°.3		75°.7		.....	

*Observer sick.

Maximum, minimum, and mean temperatures—Continued.

STATION, QUEBEC, CANADA.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min	Max.	Min.	Max.	Min.
1	(*)	59	.....	54	76	45	55	40	49	37	14	9	14	4	30	24	25	11	41	29	52	37	86	56
2	.....	59	.....	57	58	50	47	40	45	37	23	10	16	1	27	22	33	11	42	33	45	35	91	52
3	.....	61	.....	57	68	49	65	36	51	37	30	14	4	— 4	35	22	41	30	36	16	46	31	82	60
4	.....	62	.....	61	65	50	56	43	41	31	41	22	0	—11	30	22	37	14	30	18	52	32	69	57
5	.....	59	.....	61	55	43	50	39	40	26	41	22	7	— 9	32	22	24	8	34	26	54	34	69	51
6	.....	55	82	61	67	45	53	34	40	28	32	19	6	0	33	22	17	7	38	28	70	31	79	53
7	.....	55	83	66	65	44	62	34	40	28	33	24	27	9	36	23	25	8	40	26	50	36	70	52
8	.....	62	80	62	55	48	38	29	41	33	20	9	33	9	33	12	25	10	40	24	43	35	62	53
9	.....	59	85	58	62	42	42	26	40	33	20	11	11	—14	25	10	38	14	43	29	46	35	75	54
10	.....	58	89	60	74	43	50	31	42	34	3	— 2	14	—14	31	13	21	8	41	29	48	30	77	54
11	.....	63	92	60	67	40	48	33	39	35	10	—15	23	7	30	17	26	8	45	27	63	30	67	48
12	.....	60	96	67	70	47	46	31	37	34	14	9	10	—22	34	20	37	10	37	25	72	38	69	49
13	.....	60	94	65	70	42	50	27	44	32	24	14	0	—22	21	2	16	9	50	26	77	41	75	50
14	.....	59	92	69	70	40	32	26	40	28	29	12	10	—14	19	3	27	10	57	33	70	48	76	59
15	.....	52	84	61	64	49	34	25	34	25	29	15	2	—20	32	6	27	16	52	32	77	44	80	51
16	.....	52	69	50	61	34	35	26	39	23	22	—19	4	— 3	33	13	17	1	48	30	68	45	73	59
17	.....	54	76	57	63	38	40	28	30	26	2	—23	9	— 6	32	19	16	—10	45	30	59	40	74	55
18	.....	70	82	51	54	42	41	32	34	25	4	—18	26	0	36	16	12	— 5	59	30	56	45	80	47
19	.....	60	64	58	53	40	55	31	34	24	3	—16	24	9	22	7	24	3	48	32	61	44	80	53
20	.....	68	64	50	54	45	57	37	36	28	5	—10	40	5	27	10	32	7	40	33	61	47	72	44
21	.....	56	61	40	59	44	45	30	33	29	2	—15	20	— 2	37	13	27	9	41	29	64	41	61	50
22	.....	44	69	43	64	44	56	35	34	29	15	—12	20	— 4	50	17	40	20	66	36	62	47	58	46
23	.....	52	69	42	67	49	56	41	36	30	15	9	21	— 3	36	25	33	22	74	41	61	36	66	44
24	.....	51	76	43	64	48	56	39	38	26	17	6	15	— 3	32	25	40	22	58	41	50	40	68	44
25	.....	52	74	50	67	50	50	42	32	22	18	2	— 2	—14	32	25	25	15	58	43	53	42	67	54
26	.....	47	80	56	69	53	44	30	35	19	10	— 5	14	—15	42	26	35	24	68	34	51	43	72	44
27	.....	48	80	49	51	45	39	32	31	19	17	— 2	18	— 6	34	15	40	32	54	37	70	43	80	45
28	.....	56	65	46	57	36	37	28	29	19	21	8	19	1	32	10	37	31	48	30	61	50	84	50
29	.....	61	71	49	56	48	44	25	28	16	17	7	28	2	.....	.....	36	24	44	35	63	56	83	55
30	.....	54	74	48	58	43	49	28	17	11	22	12	35	16	.....	.....	45	20	44	38	80	54	76	57
31	.....	56	80	45	.....	.....	38	31	....	....	9	6	28	20	.....	.....	40	26	.....	.....	82	57	.....	.....
Range	.....	.....	.....	.....	42°		40°		40°		43°		62°		4 .°		55°		38°		53°		47°	
Monthly means	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* No observations of the maximum thermometer recorded on form 4.

Maximum, minimum, and mean temperatures—Continued.

STATION, ROCHESTER, N. Y.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	69	58	79	59	78	63	55	41	69	55	13	7	21	14	50	37	43	23	54	37	47	37	86	59
2	87	65	82	60	68	55	58	44	71	57	28	12	19	15	42	32	46	33	53	25	48	33	83	64
3	79	70	81	65	72	47	64	45	58	44	25	19	16	8	38	33	43	31	30	23	55	32	79	61
4	77	62	84	68	71	55	50	41	48	37	25	21	15	8	36	26	36	28	50	25	53	36	72	54
5	85	60	90	71	64	47	48	39	50	35	31	19	22	8	36	23	26	19	42	35	53	34	60	54
6	80	60	91	72	68	45	61	44	48	36	36	21	36	18	36	26	30	19	46	37	56	34	60	52
7	85	61	86	70	72	55	48	39	49	41	32	26	34	28	38	29	30	18	44	30	56	39	67	52
8	91	75	88	63	73	60	45	35	45	39	30	21	28	9	30	18	48	19	42	22	54	39	81	58
9	92	74	85	60	62	54	50	30	44	38	24	4	12	4	34	19	52	16	47	33	50	40	83	70
10	91	74	89	65	61	48	55	37	45	36	11	2	23	5	42	21	21	11.5	54	24	50	40	75	50
11	78	68	92	70	58	53	42	33	42	35	24	4	28	21	48	29	35	17	55	36	60	42	67	45
12	87	66	87	72	62	47	50	27	47	31	34	13	26	— 4	44	14	35	27	43	37	65	41	78	55
13	88	72	89	67	63	43	58	35	56	33	46	32	18	0	20	12	28	22	49	33	69	43	84	55
14	86	70	87	68	71	52	52	28	53	36	38	34	20	14	29	7	42	20.5	53	34	73	44	73	64
15	82	62	86	67	63	54	36	26	38	33	34	15	26	10	38	18	25	18	58	33	77	48	89	64
16	85	59	73	63	65	49	48	32	44	29	26	0	22	13	40	26	27	15	62	37	81	60	76	62
17	92	63	78	60	56	48	48	36	44	33	8	— 1	24	11	26	16	18	7	59	41	78	61	76	57
18	87	71	83	62	63	55	51	28	51	39	24	5	32	9	28	14	19	— 1	51	42	83	66	86	54
19	90	65	83	68	62	57	64	34	47	39	18	12	37	28	27	16.5	24	6.5	49	40	78	60	76	60
20	92	67	71	58	66	53	70	47	44	36	14	6	42	16	33	19	30	8	45	35	80	60	66	53
21	73	61	72	50	70	56	73	58	47	39	24	6	17	10	42	30	41	28	57	37	77	64	77	58
22	75	52	76	48	68	59	64	58	47	37	30	20	29	13	53	38	42	31	67	41	65	49	64	53
23	69	56	83	63	63	54	70	52	38	32	25	17	21	9	47	35	50	31	71	44	55	37	74	45
24	73	52	85	59	62	57	58	43	35	31	20	10	18	10	39	32	34	26.5	72	45	53	37	81	57
25	65	50	86	62	70	57	45	38	39	31	17	8	18	9	33	30	51	29	54	38	62	43	82	67
26	68	50	75	51	60	47	43	38	36	29	28	16	36	15	35	29	47	37	59	37	67	46	70	60
27	78	51	73	51	50	40	41	35	34	27	24	16	38	27	37	29	39	30	56	40	71	48	74	57
28	74	64	75	48	61	42	40	33	35	27	25	15	37	20	35	25	30	22	55	42	75	49	80	57
29	76	60	78	53	58	46	41	30	35	28	24	18	43	29	.....	.....	36	20	62	50	77	52	80	61
30	75	58	84	60	54	43	58	28	29	12	21	14	33	25	.....	.....	42	27	50	40	81	56	82	62
31	79	63	85	66	.....	.....	70	48	.....	.....	22	15	46	18	.....	.....	45	33	.....	.....	83	55	.....	.....
Range	42°		44°		38°		47°		59°		47°		50°		46°		53°		49°		51°		44°	
Monthly means	71°.8		72°.4		57°.9		45°.7		40°.1		19°.7		21°.0		31°.2		28°.9		45°.5		57°.1		66°.	

Maximum, minimum, and mean temperatures—Continued.

STATION, RICKLIFFE, CANADA.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1													*12.4	−10.1	37.3	32	41.1	13.2	44.6	33.5	38.6	31	89.7	48.3
2													14.1	− 2	41	32.4	37.3	25.7	42.6	18.2	41.4	28.5	81.5	50.8
3													0.7	−14.6	37.7	24.1	35.1	18.9	32.1	5.7	50.5	24.4	73.9	46.5
4													1.5	−16.4	34.3	17.1	24.9	13.5	38.9	12.4	50.2	28.3	60.2	43.5
5													12.3	−19	32	21.1	19.8	− 7.4	42.4	29.5	55.3	22.7	66.5	38.5
6													22.8	6	37.7	26.9	20.1	− 9.4	47.4	28	59	28	77.5	39.2
7													29.8	16.2	36.7	15.1	17.1	8	40.4	48.5	55.6	30.2	79	42
8													18.1	−19.6	20.8	5	19.3	8	52.1	14.7	57	31	89.2	60.7
9													0.3	−30.4	32.5	8	17.2	3	57.6	22.1	51.8	37.5	73.7	59.2
10													21.2	− 3.6	39.5	17.9	21.7	− 3.3	60.5	26.8	54.7	43	67.5	44.7
11													21.8	−18.5	37.8	16.1	29.7	− 4.1	55	29	65.5	40.4	62.7	34.3
12													−14	−34.2	34.5	2.8	33.4	−13.2	49.9	26.8	72.7	36.5	74	43.8
13													18.1	−29.6	16.7	− 5.2	27.9	− 8.1	55.6	19.6	73.2	37.6	68.4	48.5
14													19.9	−19	26	−12.8	32.9	15.1	59.7	21.8	78.3	39.6	75.3	43.6
15													5.7	−16.8	24.6	−13.8	24.3	9.6	61.6	24.7	79.9	36.4	80.6	44.9
16													12.4	0.7	36.7	15.3	16.4	− 7.4	61.1	21.4	80.1	46.6	68	51.1
17													12.3	−21	19.2	6.6	8.1	− 2.8	61.4	27.6	80.2	54.4	77.5	44.3
18													29.6	− 6.5	25.1	− 3.2	17.8	−16.9	60.6	27.6	78.9	54.3	85.7	43.2
19													23.9	−15.6	27.6	0.5	25.8	−22.8	45.8	36.8	80.7	55.9	67	43.2
20													36.6	− 1.9	33.1	16.3	36.1	2.1	45.2	35	77.9	57.9	69	34
21													17.5	−10.8	43.8	13.3	34.9	20.1	63.6	35.8	64.1	48.7	65.8	51.1
22													24.3	− 4.2	47	13.5	36	22.9	71.6	29.4	66.9	46	65.3	41.6
23													16.5	−11	34.6	20.7	37.2	19.9	79	28.3	47.1	33.6	69.8	37
24													10.9	− 2	43.9	26	31.5	0.2	71	35.5	56.8	35.2	75.8	45.5
25													3.2	−21.7	32.1	15	29.1	21.1	55.4	31	65.8	40	78.6	57.8
26													17.5	− 7.2	40.7	20.9	40	28	63.5	24.1	69.7	42.5	72.8	51.3
27													25.5	− 9.6	37.1	9.6	40	22.9	51.2	31	78	40.2	79.7	40.8
28													16	−16.6	36.7	2	27.1	15.9	39.7	33.3	81.7	42.7	81.5	51.9
29													26.6	14.5	.....	.....	38.5	13.5	52.4	39.7	81.3	42.2	67.2	51.4
30													32.6	23.7	.....	.....	46	16.2	50	32.4	84.7	42.2	68.3	52
31													33.3	25.4	.....	.....	45.7	26.1	.....	.....	86.2	50.3	.....	.....
Range													70°.8		60°.8		68°.8		73°.3		63°.3		55°.7	
Monthly means																								

*Station commenced reporting January 1, 1877.

Maximum, minimum, and mean temperatures—Continued.

STATION, SALT LAKE CITY, UTAH.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	85	63	86	63	85	57	76	56	46	31	41	24	35	19	40	30	49	34	57	35	57	34	66	43
2	95	59	90	63	90	62	76	48	47	32	42	25	35	15	33	21	52	38	55	40	60	37	72	44
3	94	66	92	62	89	66	74	50	48	32	41	26	29	12	37	28	44	34	55	39	64	43	72	51
4	89	65	86	68	90	66	74	54	54	34	43	23	34	17	39	26	45	31	62	40	66	44	74	49
5	94	61	85	61	82	61	74	48	52	37	35	20	41	27	36	20	52	27	65	40	65	45	68	52
6	96	70	94	60	76	56	80	52	49	29	30	20	40	24	36	18	57	33	63	45	70	43	65	47
7	82	61	95	66	67	47	80	53	50	30	30	20	45	26	33	18	45	34	62	42	75	54	58	40
8	77	52	93	57	75	49	83	56	53	33	29	19	47	26	32	15	45	35	50	40	67	47	67	47
9	86	57	74	55	81	52	78	58	56	33	29	18	47	30	31	16	49	34	50	34	60	43	77	46
10	87	67	78	48	82	53	68	50	62	34	30	18	50	39	33	15	55	40	58	38	63	42	78	53
11	79	58	90	55	75	54	76	51	56	39	28	16	42	22	34	17	53	38	57	43	65	45	79	55
12	84	56	83	62	72	50	66	52	46	29	32	14	28	18	37	17	60	40	60	37	70	50	85	55
13	89	62	82	54	74	49	62	52	43	27	31	19	29	13	44	29	63	40	60	40	70	50	84	56
14	92	63	89	65	83	49	62	50	52	34	27	15	30	20	41	27	70	43	68	38	70	45	73	60
15	87	62	84	66	85	60	70	46	49	35	26	16	32	16	39	29	64	48	68	53	73	45	83	56
16	84	64	82	53	70	56	67	47	55	38	25	15	36	16	38	26	55	40	60	40	68	52	90	58
17	90	56	85	57	70	54	57	45	55	40	26	18	37	30	40	25	65	38	55	35	70	35	87	67
18	94	63	89	57	70	57	55	42	57	32	25	13	48	29	41	26	65	47	57	37	45	34	90	60
19	89	64	89	63	74	48	50	37	54	36	25	15	41	34	45	25	59	43	68	38	65	40	90	60
20	91	61	86	67	83	53	48	34	44	34	34	16	35	25	48	26	57	37	56	33	73	43	84	62
21	97	67	84	55	78	63	51	33	42	33	35	20	36	16	50	38	71	37	50	30	69	47	90	61
22	91	70	76	54	68	51	59	43	40	28	38	24	27	13	52	34	55	39	46	30	69	52	85	65
23	89	65	70	57	72	45	62	42	46	26	30	16	24	4	55	35	52	40	50	35	63	41	68	56
24	84	64	70	46	73	46	65	40	53	30	34	23	23	3	46	37	61	35	55	38	72	40	77	47
25	85	62	85	50	75	48	70	40	56	32	38	24	25	5	47	35	70	42	60	40	77	49	71	44
26	90	66	85	61	80	53	67	53	55	37	40	30	26	6	52	38	70	50	58	48	83	51	75	52
27	93	66	84	58	80	57	64	45	48	34	39	27	27	8	53	38	73	50	58	43	83	60	85	52
28	90	65	85	60	83	56	65	39	45	30	37	27	30	10	52	37	70	50	60	39	82	58	90	63
29	93	68	86	60	77	53	50	35	37	27	45	32	34	19	.....	.....	68	51	62	44	67	42	70	47
30	96	69	81	57	74	51	42	33	40	23	38	28	40	20	.....	.....	55	35	70	43	54	41	78	47
31	91	68	83	57	.....	.....	43	30	.....	.....	34	18	40	26	.....	.....	45	37	.....	.....	56	40	.....	.....
Range	45°		43°		45°		53°		39°		32°		47°		40°		46°		40°		49°		50°	
Monthly means	76°.9		72°.6		65°.6		54°.6		40°.5		26°.6		27°.9		33°.7		48°.0		48°.6		56°.7		65°.9	

Maximum, minimum, and mean temperatures—Continued.

STATION, SAN DIEGO, CAL.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	74	64	81	65	75	62	80	65	66	50	74	50	69	49	63	53	64	53	61	47	61	56	69	55
2	74	65	78	66	78	64	75	66	65	49	71	52	67	48	65	48	63	57	63	51	65	56	68	59
3	73	65	78	66	76	64	75	64	69	47	69	50	72	47	73	51	63	55	63	54	65	57	68	57
4	75	64	74	66	73	62	70	64	65	52	67	48	70	46	75	53	62	52	63	50	64	58	70	59
5	74	65	74	67	70	58	69	64	65	53	77	53	75	53	69	50	64	48	63	49	67	56	70	59
6	72	63	74	65	70	62	72	64	71	52	73	53	78	55	70	47	65	53	63	53	66	57	69	59
7	75	63	76	66	70	55	71	60	78	52	66	49	71	53	66	45	65	55	64	57	67	59	69	59
8	73	63	80	67	70	55	69	63	79	58	66	48	70	50	70	47	69	48	65	56	65	57	79	56
9	74	62	77	68	70	55	71	63	75	57	64	46	67	45	67	48	69	49	67	53	65	57	93	60
10	76	62	81	66	72	55	69	60	74	60	69	46	63	50	65	54	64	52	61	53	64	57	94	68
11	76	62	80	65	74	57	69	62	65	54	70	49	63	55	64	49	65	52	65	52	64	55	92	70
12	75	66	77	67	72	54	69	62	66	53	66	52	60	51	62	54	65	55	67	51	64	56	87	67
13	72	64	75	68	72	58	68	60	68	46	61	55	57	48	63	46	67	55	63	53	66	54	74	65
14	71	61	75	66	72	61	69	57	72	50	64	49	57	42	63	50	65	53	63	56	66	51	74	62
15	72	63	74	61	72	64	68	56	71	50	69	45	58	47	63	51	64	54	66	53	66	53	69	62
16	73	62	76	60	69	63	69	62	65	49	71	49	60	42	64	54	65	55	61	53	66	52	70	58
17	73	61	79	65	71	63	71	62	67	43	66	50	61	48	63	49	64	54	63	49	67	53	69	63
18	74	62	73	67	70	64	69	64	70	47	66	46	62	51	63	51	63	53	66	48	64	56	71	63
19	74	60	73	65	71	64	69	62	62	47	65	48	61	46	67	51	63	55	67	49	67	57	69	62
20	75	62	71	65	71	63	69	59	63	50	65	50	62	48	72	50	63	55	62	54	66	58	69	61
21	75	65	71	63	70	62	76	59	65	50	63	54	61	48	71	51	63	57	66	57	64	56	70	60
22	75	65	71	61	70	63	79	56	77	48	62	46	65	51	75	54	65	57	62	46	66	55	69	59
23	78	65	72	64	71	62	75	55	66	46	64	45	70	53	67	55	66	52	62	46	67	52	72	60
24	76	67	71	64	70	61	71	56	70	50	63	45	65	56	65	56	67	52	63	44	66	56	72	61
25	74	67	71	63	70	64	68	55	75	52	64	43	65	48	65	57	70	54	66	47	66	58	73	63
26	73	66	70	63	70	64	68	55	79	56	63	49	64	49	59	51	68	58	65	54	69	60	71	63
27	74	64	70	63	71	63	69	56	66	52	64	50	65	47	63	45	67	59	63	56	68	59	72	59
28	72	61	71	64	71	63	69	58	66	52	63	48	64	52	63	51	67	56	64	55	67	58	72	59
29	75	62	71	64	75	63	67	53	65	50	62	53	64	52	.....	.....	61	53	64	56	63	58	72	63
30	76	64	70	61	82	62	67	48	73	46	63	54	65	50	.....	.....	59	48	65	55	66	54	75	59
31	76	65	72	63	.....	.....	67	51	.....	.....	66	48	64	50	.....	.....	61	53	.....	.....	68	53	.....	.....
Range	16°		21°		28°		32°		36°		34°		36°		30°		22°		23°		18°		39°	
Monthly means	68°.6		69°.1		65°.9		64°.2		58°.9		56°.5		56°.9		57°.8		59°.3		58°.3		60°.4		66°.9	

Maximum, minimum, and mean temperatures—Continued.

STATION, SANDY HOOK, N. J.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	89	69	77	64	87	67	60	49	65	49	23	16	25	16	51	37	46	33	48	36	60	48	85	64
2	94	75	73	66	76	66	61	49	70	55	27	18	24	20	46	37	51	36	49	38	53	43	87	63
3	87	77	73	65	74	60	65	52	64	50	35	26	23	11	40	36	51	41	48	33	58	40	87	66
4	94	74	78	67	79	60	63	55	56	46	35	23	20	8	41	34	48	33	43	38	61	47	79	66
5	89	74	84	67	70	58	56	51	51	46	35	25	24	11	42	31	39	28	44	36	56	46	73	66
6	86	72	90	70	74	57	72	55	54	44	39	26	36	18	40	33	42	26	51	39	57	46	71	62
7	88	69	93	73	69	61	67	48	56	49	42	33	45	36	41	31	47	33	53	39	64	55	68	60
8	100	72	88	74	74	63	58	42	52	46	42	31	42	27	39	32	55	36	50	34	56	44	78	62
9	97	70	84	70	72	62	53	41	54	45	38	8	28	14	37	25	55	30	46	38	54	46	82	63
10	86	68	86	70	67	57	66	49	47	41	19	6	28	18	39	28	31	23	52	39	52	45	79	65
11	95	72	85	69	62	55	58	42	47	41	26	17	36	18	45	33	45	23	61	40	60	44	67	59
12	92	71	85	70	68	59	58	39	51	41	36	24	37	20	54	28	48	37	52	38	63	49	69	58
13	95	74	83	72	70	59	61	42	59	42	49	31	28	20	29	19	41	35	45	37	71	48	73	61
14	87	75	80	73	75	63	66	45	59	42	47	35	29	21	35	18	40	33	48	38	77	52	82	64
15	92	73	89	71	73	61	46	33	46	41	42	28	33	25	44	18	37	25	59	39	76	54	80	64
16	88	70	85	73	65	51	49	35	46	39	37	8	41	30	51	36	36	27	57	39	82	59	76	69
17	89	69	79	69	72	55	54	42	48	41	22	7	31	24	41	28	36	19	58	43	84	63	79	67
18	93	73	77	69	73	65	56	39	51	45	34	14	36	26	35	25	27	17	46	43	82	64	80	64
19	95	72	77	69	71	61	59	43	48	45	26	14	40	32	37	21	27	14	49	42	86	65	83	68
20	96	72	84	67	68	61	56	47	48	44	23	14	44	36	35	21	33	20	51	45	88	63	72	61
21	86	73	74	61	65	59	59	55	48	42	23	19	38	24	43	31	56	30	51	42	64	55	79	60
22	77	68	79	61	61	58	61	55	48	42	36	17	30	24	52	34	56	39	62	42	74	54	73	60
23	84	68	77	68	63	57	61	56	47	40	34	20	33	23	41	34	56	38	67	44	67	55	73	57
24	78	62	81	69	63	59	61	53	43	37	24	17	33	16	40	33	58	39	74	48	55	45	82	57
25	77	61	85	69	65	58	59	45	44	34	28	17	25	16	41	34	42	37	63	50	60	48	84	67
26	82	63	81	68	65	57	51	42	43	35	33	28	38	21	39	34	46	37	62	46	68	52	88	66
27	82	64	77	65	60	49	46	41	41	34	33	25	43	31	42	33	48	39	61	49	66	53	72	61
28	85	67	78	63	64	48	47	40	41	34	30	21	36	28	46	34	40	28	50	46	73	52	71	59
29	84	68	80	76	72	55	47	37	41	33	42	25	37	31	.....	.....	35	30	59	46	77	54	71	59
30	70	64	79	67	62	51	54	39	36	23	38	23	39	30	.....	.....	48	33	64	46	79	57	78	60
31	73	62	80	67	.....	.....	57	49	.....	.....	28	18	43	31	.....	.....	47	35	.....	.....	87	60	.....	.....
Range	39°		32°		39°		39°		47°		43°		37°		36°		44°		41°		48°		31°	
Monthly means	77°.7		74°.2		63°.9		51°.3		45°.9		27°.3		28°.7		36°.2		37°.4		47°.2		59°.2		69°.2	

Maximum, minimum, and mean temperatures—Continued.

STATION, SAN FRANCISCO, CAL.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	65	53	63	52	67	56	62	55	60	51	61	49	61	49	65	57	63	55	59	49	65	50	64	51
2	64	55	64	52	60	52	66	55	61	51	59	47	61	47	63	56	59	53	57	49	61	49	63	51
3	63	53	61	52	63	54	62	55	62	50	57	47	61	49	62	50	59	51	61	50	60	50	65	53
4	64	54	62	53	69	58	60	53	61	55	60	49	62	48	64	50	62	49	60	51	60	50	66	51
5	63	54	64	55	65	57	61	54	64	53	62	48	69	53	61	50	66	55	57	50	62	50	68	51
6	62	53	64	55	64	55	65	52	60	53	63	48	67	54	63	49	62	54	59	50	60	52	67	53
7	62	53	62	55	64	55	64	54	69	54	60	49	66	50	64	50	60	50	57	49	60	50	73	54
8	63	52	65	53	64	56	68	57	70	55	59	47	66	51	61	46	60	50	60	49	60	48	87	65
9	67	54	74	53	63	54	62	56	69	55	54	47	64	50	59	48	62	52	59	49	61	50	88	62
10	73	55	76	57	70	54	68	54	64	54	52	43	64	51	57	47	61	56	60	49	59	52	86	63
11	76	56	72	58	74	57	64	56	61	54	55	42	55	46	56	46	63	54	64	50	63	51	92	64
12	67	54	66	54	67	53	63	54	63	54	60	48	52	44	58	50	62	53	61	49	64	54	88	64
13	62	53	64	54	69	56	61	53	63	50	62	49	52	42	56	49	66	52	59	50	65	52	66	56
14	63	52	63	54	67	53	66	54	64	50	60	47	52	42	58	50	61	52	62	51	63	52	66	55
15	64	51	68	57	64	52	64	56	64	54	60	47	56	43	62	48	66	53	58	50	63	53	67	56
16	63	52	62	51	67	54	65	59	64	57	56	46	56	47	65	48	68	52	59	48	62	53	65	56
17	62	52	60	51	64	55	66	59	62	54	56	44	52	45	65	51	63	49	61	48	63	52	63	54
18	63	52	62	52	67	54	65	59	59	51	56	45	58	49	60	52	64	52	62	49	75	52	63	55
19	65	55	63	54	74	56	65	55	62	53	57	47	60	51	67	53	68	51	57	50	62	52	62	54
20	63	54	63	53	64	55	70	57	59	51	61	49	57	49	66	56	73	54	60	46	58	49	63	52
21	62	53	62	53	64	54	70	56	65	50	58	47	54	48	66	56	61	51	60	49	59	49	63	53
22	63	53	64	55	69	55	67	55	64	52	59	44	58	47	62	52	61	51	58	48	61	48	68	55
23	63	54	63	55	71	55	72	53	64	51	63	54	60	49	60	52	67	51	60	48	61	48	71	55
24	64	52	69	54	75	57	65	53	65	52	64	46	61	49	57	48	68	54	63	48	59	49	68	55
25	63	52	67	53	86	62	64	53	66	53	58	47	61	50	59	49	62	52	60	52	61	50	64	53
26	63	53	68	54	72	57	69	61	64	51	58	45	59	48	61	49	67	52	58	52	64	50	65	52
27	64	54	64	51	67	54	65	61	61	51	62	48	61	49	60	49	59	50	59	50	62	50	68	55
28	66	53	61	52	69	58	64	55	62	50	61	48	59	53	58	51	59	51	60	50	61	51	63	53
29	69	54	66	53	64	57	61	55	63	50	58	48	65	53	.....	.....	57	48	59	49	61	50	66	54
30	64	54	68	56	64	56	59	52	64	51	60	44	59	55	.....	.....	59	48	60	48	61	51	64	54
31	74	56	68	58	.....	.....	62	52	.....	.....	62	48	62	54	.....	.....	59	47	.....	.....	66	50	.....	.....
Range	25°		27°		34°		20°		20°		22°		27°		21°		26°		18°		27°		41°	
Monthly means	58°.8		58°.8		60°.6		59°.2		57°.8		53°.0		54°.1		55°.4		56°.3		54°.1		55°.3		61°.6	

Maximum, minimum, and mean temperatures—Continued.

STATION, SANTA FÉ, N. MEX.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	67	54	89	63	81	55	59	39	40	29	46	18	37	9	53	28	44	21	51	22	63	34	68	36
2	81	50	88	61	75	55	66	39	40	23	49	26	40	13	50	26	50	26	42	31	66	40	76	43.5
3	86	56	84	56	82	52	72	38	45	31	50	30	37	14	51	23	53	34	51	26	55	31	79.5	47
4	87	62	85	54	81	51	70	44	50	27	45	28	39	15	52	23	55	32	61	31	58	29	79	45
5	85	61	81	52	82	57	71	38	54	27	44	19	41	12	41	27	52	18	65	34	66	36	78	50.5
6	85	62	86	55	81	52	71	47	53	27	50	23	45	23	38	23	58	27	63	34	62	32	75	50.5
7	76	53	81	56	77	53	72	41	56	32	47	24	46	21	41	19	50	28	63	37	69	42	68	42.5
8	73	56	83	57	75	51	78	48	61	33	46	17	38	6	42	19	48	15	60	32	73	46	59	37.5
9	79	53	80	54	78	44	73	42	62	35	52	20	47	23	44	20	59	28	56	34	72	44	67	33
10	83	54	81	52	78	45	74	43	64	34	48	23	50	25	45	20	64	32	46	30	72	43	74	41
11	85	57	83	50	81	49	68	46	60	35	51	23	51	27	44	28	63	33	40	28	72.5	42	73	45
12	87	61	86	57	82	49	66	40	45	37	52	24	50	30	37	20	62	30	52	20	68.5	37	79	45
13	84	60	89	57	72	43	60	48	37	21	51	22	51	33	38	20	61	32	52	30	71	48.5	87	51
14	80	55	73	59	68	50	65	41	39	20	47	21	43	23	45	23	66	38	59	34	70	40.5	87	56
15	76	57	81	55	77	49	47	32	45	24	44	17	32	19	51	29	70	39	67	38	70	40	86	54
16	76	52	81	58	69	47	55	35	47	28	50	19	31	13	40	27	66	37	61	36	60	41	88.5	60
17	73	55	80	58	73	44	55	34	49	29	51	19	42	16	46	22	64	28	49	27	57	38	88	60
18	73	55	85	56	62	43	58	38	51	25	36	11	51	26	46	22	67	32	58	32	50	34	89	57
19	76	52	73	54	65	40	55	34	52	29	46	13	52	30	52	26	(*)	(*)	62	28	53	32	85	60
20	77	56	75	56	73	44	45	27	53	29	50	22	39	25	49	24	71	36	66	32	63	34	85	51
21	76	56	78	52	78	44	42	28	40	24	44	22	42	22	53	29	64	30	65	35	70	42	89.5	50.5
22	77	56	71	51	76	45	56	27	36	22	36	16	41	20	50	22	69	30	55	34	75	49	89	56.5
23	80	55	76	47	79	47	60	37	38	10	35	18	37	11	50	26	69	39	62	28	77.5	45	89	50
24	84	56	83	46	76	48	63	32	44	23	19	— 1	41	21	56	28	58	19	61	35	72.5	47	81	47.5
25	78	56	70	45	75	49	65	35	49	25	26	0	44	21	48	32	67	28	50	35	74	41.5	79	46
26	82	58	66	54	70	45	67	39	52	35	27	4	47	22	42	31	70	37	40	28	78	49	81	47
27	83	59	73	53	60	53	65	36	56	30	32	19	52	23	35	27	70	43	40	29	79.5	50	86.5	46
28	85	59	78	45	63	48	66	37	50	29	34	11	53	27	36	24	65	36	47	26	81	44	90	57
29	87	60	79	50	67	41	60	39	40	26	38	15	46	31	.....	.....	66	38	43	31	73	43.5	88.5	62
30	86	63	80	53	63	38	57	30	43	15	38	16	47	26	.....	.....	63	34	52	29	58	41	85	51
31	87	61	81	52	.....	.....	53	32	.....	.....	32	14	52	27	.....	.....	49	24	.....	.....	60	32	.....	.....
Range	37°		44°		44°		51°		54°		53°		47°		37°		.....		47°		52°		57°	
Monthly means	69°.2		65°.2		60°.2		48°.6		35°.7		28°.5		31°.7		33°.3		*44°.4		42°.3		54°.4		66°.6	

* 29 days mean.

Maximum, mimimum, and mean temperatures—Continued.

STATION, SAUGEEN, CANADA.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max	Min.	Max.	Min.
1	78	46.2	80	52.3	67	56.5	49	43.1	56	47.7	21	6.6	21	13.5	42	32.6	41	16.6	63	34.1	39	32.1	83.5	58.3
2	74	57.5	78	54.3	64.5	47.1	60	44.1	61	42	25	18.5	21	9.1	40	31.6	49	27.1	37	16.1	42	29.1	75	62.3
3	77	63.3	80	61.3	62	43.1	62	44.2	52	40.3	27	21.1	14	1.9	33.8	29.1	32	23.1	38	7.1	49	28.6	69	50
4	75	60.1	83	59.8	64	55.3	51	38.6	47	38	27	20.1	15	2.1	32	24.1	26	14.1	50	17.1	45	29.1	62	44.2
5	71	51.3	83	65.3	63	39.1	49	36.1	50	36.6	33	22.1	21	9.1	33	22.6	24	11.1	42	30.1	60	37.1	64	40.1
6	75	50.5	83	66.3	67	38.1	55	40.1	46	36.6	38	26.1	30	6.1	43	29.1	29	5.1	39	25.1	63	33.6	75	42.6
7	86	62.3	77	63.3	70.5	53.3	46	34.1	46	33.1	38	21.6	33	16.6	43	20.6	36	11.1	46	19.1	62	38.1	79	42.1
8	86	60.8	76	50.2	65	55.8	50	32.1	39	34.1	25	12.1	17.5	1.1	30	6.6	20	13.1	50	28.1	54	38.1	76	56.3
9	89	62.8	80	51.3	67	45.2	52.1	27.1	39	31.9	15	3.1	11	2.1	34	11.3	21	13	54	33.1	51	33.1	71	46.4
10	76	57.1	85	57.3	66	52.3	53	36.6	41	27.6	8	— 4.1	22	6.1	38	26.1	19	8.6	54	33.1	53	36.6	54	43.1
11	74	53.3	83	64.8	70	45.7	40	32	46	28.1	21	— 2.1	26	0.6	48	28.1	30	4.1	50	26.6	52	35	70	41.1
12	81	60.3	80	66.5	62	38.1	47	29.1	53	30.1	34	20.1	2	—19.4	48	9.1	32	15.1	44	25.6	54	29.9	70	49.4
13	79	58.3	84	64.8	66	32.8	50	40.1	58	36.1	39.5	30.1	20	— 8.1	20	4.1	36	6.1	52	26.9	58	32.1	69	49.1
14	70	60.3	85	65.8	62	48.2	53	26.6	39	29.1	42	19.1	22	3.1	33	6.6	38	15.1	42	25.1	64	36.3	67	44.2
15	77	52.8	76	62.8	62	42	37	25.1	36	22.1	30	5.1	23	8.1	36	18.1	26	13.1	40	25.1	72	45.2	84	51.2
16	78	50.2	74	52.3	70	36.1	50	36.4	39	28.1	24	— 0.9	18	7.1	43	20.1	22	6.1	50	35.1	74	47.2	61	45.4
17	86	58.2	74	59.3	65	45.2	49	26.1	46	29.1	7	— 3.1	25	10.3	22	9.9	11	8.6	64	34.3	75	49.2	68	41.1
18	84	61.1	78.5	59.5	58	51.8	51	25.1	45	36.1	20	2.6	28	15.1	28	16.1	26	— 2.9	62	43.1	74	54.1	82	50.2
19	86	55.8	74	60.3	64	51.3	68	35.1	51	43.1	20	5.1	34	23.1	23	4.3	23	— 7.1	50	39.6	76.1	48.2	60	43.1
20	80	55.1	69	53.1	79	52.1	66	45.2	45	40.1	12	0.1	44	13	36	4.6	28	2.1	47	32.5	81	58.5	77	38.9
21	66	48.8	66	39.1	71	54.8	69	46.2	44	38.9	19	6.1	16.5	8.3	45.5	29.6	36	22.1	49	27.9	74	51.3	66	41.1
22	65	46.2	74	45.2	75	53.8	63	45.4	45	32.6	25	16.6	22	14.5	51	34.1	42	23.6	61	29.6	60.1	47.7	55	38
23	64	49.2	77	60.3	63	57.3	62.1	44.2	37	31.3	20	9.1	19	8.6	38	28.6	42	13.1	71	43.3	51	38	70	34.1
24	62	52.3	84	60.3	69	51.6	49	37	34	28.1	17	3.1	18	8.1	37	26.1	31	10.1	62	33.1	46	36.1	75	52.8
25	64	45.6	73	49.1	71	50.3	45	36	34	27.6	19	— 2.1	20	9.1	33	18.9	32	22.3	42	28.9	50	32.1	71	58.3
26	68	38.3	69	45.2	62	44.2	43	33.6	38	23.1	24	15.3	32	11.1	32	19.1	32	25.1	52	26.1	56	36.1	76	55.4
27	79	52.3	66	46.2	63	44.1	39	31.1	33	26.2	23	18.1	37	5.1	30.5	11.6	34	26.1	56	33.1	58	36.1	72	50.2
28	69	51.1	70	42.1	58	44.1	44	32.1	36	27.1	24	20.1	39	7.1	35	16.1	30	21.1	48	38.1	67	40.1	69.3	50.5
29	71	48.7	76	52.3	54	39.1	50	27.1	34	21.1	22	13.1	42	15.1	.....	.....	32	10.1	44	39.3	74	47.2	71.3	52.8
30	73	51.3	80	50.3	52	39.1	57	35.1	23	7.6	20	12.1	44	14.6	.....	.....	41	10.1	51	33.1	77	53.8	82.2	56.7
31	74	50.2	85	58.3	.....	.....	58	48.2	.....	.....	22	15.6	45	26.1	.....	.....	45	33.1	.....	.....	75.1	55.3	.....	.....
Range	50°.7		45°.9		46°.2		43°.9		53°.6		46°.1		64°.4		46°.9		56°.1		63°.9		50°.1		49°.4	
Monthly means	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

Maximum, minimum, and mean temperatures—Continued.

STATION, SAVANNAH, GA.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	93	76	84	70	96	77	67	49	76	55	39	27	55	35	70	50	65	47	74	55	67	52	81	59
2	93	76	87	71	94	77	62	41	79	58	38	29	46	29	72	49	67	57	78	58	72	48	84	61
3	95	77	90	75	86	72	70	48	78	65	45	22	45	27	71	54	67	51	72	59	78	53	91	66
4	94	77	87	74	82	72	(*)	(*)	68	50	46	26	46	28	64	55	76	54	63	54	79	59	87	68
5	93	75	89	75	87	71	.....	.....	66	53	42	27	50	29	59	51	74	47	74	51	78	64	89	70
6	93	77	94	75	87	72	78	68	67	53	52	26	65	45	60	48	54	39	77	54	83	64	92	70
7	93	75	91	75	89	73	79	68	67	60	60	37	55	45	56	47	66	37	76	58	74	63	89	71
8	93	76	89	74	91	73	72	52	58	39	56	46	64	37	66	46	76	52	77	55	72	59	93	75
9	96	75	89	74	91	75	62	51	58	37	54	35	50	30	62	42	69	39	69	50	72	53	91	77
10	97	78	90	75	90	75	68	55	56	40	50	26	53	29	51	40	52	31	53	46	70	54	91	76
11	94	80	92	75	91	71	68	59	59	35	65	38	58	33	66	41	57	36	62	44	72	56	78	69
12	93	76	92	75	81	70	66	50	68	42	61	47	73	44	67	40	71	45	66	47	75	57	76	60
13	98	78	90	73	86	73	64	50	71	42	64	38	76	60	55	47	75	59	76	50	70	61	82	71
14	99	78	89	72	87	73	73	58	73	50	62	47	73	59	51	35	82	57	61	42	76	60	84	71
15	100	79	91	72	84	72	73	64	76	51	61	48	76	61	46	35	65	50	67	47	77	62	86	72
16	99	80	90	73	76	69	61	42	67	50	62	36	78	63	53	43	69	45	74	50	77	62	89	73
17	96	78	94	74	81	65	69	40	64	52	60	39	76	57	55	42	75	47.5	78	57	78	59	90	72
18	98	73	96	76	85	66	71	48	63	51	65	40	68	57	60	38	59	40	78	60	76	61	90	71
19	98	72	97	78	85	67	70	60	69	54	48	26	78	57	68	45	71	46	72	65	82	68	92	75
20	94	79	94	79	87	69	71	64	61	39	55	30	75	56	60	46	72	50	82	62	86	72	94	76
21	93	73	96	74	85	69	79	63	67	44	63	42	73	59	62	35	79	52	76	61	91	72	92	77
22	89	71	85	73	86	74	81	62	70	47	65	52	68	54	63	41	60	48	74	53	94	74	93	76
23	96	75	87	73	85	70	73	61	70	48	65	46	56	47	64	50	72	44	79	53	94	73	83	72
24	96	71	87	74	87	70	71	51	58	39	49	37	55	43	62	45	74	50	84	57	83	66	89	71
25	74	67	87	74	86	68	71	53	53	41	42	34	52	33	61	40	69	55	85	62	74	63	97	73
26	84	66	91	74	86	69	69	42	58	38	43	39	59	43	61	40	59	46	80	63	74	56	99	79
27	83	71	89	75	76	60	64	46	67	43	47	38	64	46	62	44	71	47	83	64	73	56	99	77
28	89	74	82	74	75	55	68	45	71	52	48	41	60	40	65	42	75	51	83	66	70	59	93	76
29	93	76	85	72	79	59	74	47	67	49	61	33	65	39	.....	.....	70	49	80	65	74	62	86	72
30	93	70	89	72	83	61	77	54	56	33	42	27	67	43	.....	.....	63	49	73	59	77	58	91	73
31	87	72	93	75	.....	.....	77	55	.....	.....	43	25	65	42	.....	.....	71	50	.....	.....	80	60	.....	.....
Range	34°		27°		41°		41°		46°		45°		51°		37°		51°		43°		46°		40°	
Monthly means	84°.5		84°.1		78°.0		61°.6†		56°.4		44°.9		51°.1		52°.5		58°.5		65°.1		70°.0		81°.3	

*No observations taken on 4th and 5th of October.

†Mean of 29 days.

Maximum, minimum, and mean temperatures—Continued.

STATION, SHREVEPORT, LA.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	90	73.5	92	73	95	74	66	43	78	61	36	24	40	21	72	53	55	45	74	61	76	47	89	70
2	90	73	92	72	91	71	73	42	69	49	45	25	46	19	64	59	63	46	65	48	79	52	88	72
3	94.5	73.5	92	69	91	73	77	51	61	42	51	26	43	23	60	52	78	48	56	50	76	60	89	69
4	92	73.5	91	69	91	75	84	59	69	51	47	27	49	17	66	47	56	36	68	51	69	59	88	68
5	95	75.5	92	72	94	74	80	62	77	57	52	26	50	32	64	43	51	37	77	57	78	53	90	66
6	94	75	96	74	95	75	85	66	69	52	54	34	48	35	65	40	62	35	83	63	80	63	92	72
7	91.5	75	95	74	94	75	73	57	61	43	56	48	59	28	67	45	70	50	77	60	75	57	88	75
8	83.5	74	94	73	92	74	70	50	63	42	58	39	50	23	65	47	65	36	64	58	72	57	89	74
9	86.5	74	96	72	90	73	71	51	64	41	47	32	46	20	57	43	44	31	73	52	76	52	82	63
10	90	73	79	73	86	72	80	52	71	41	60	33	64	36	65	39	56	31	71	55	79	62	78	55
11	94.5	76	90	75	81	63	69	54	74	50	62	36	72	53	64	42	70	46	74	50	80	61	83	59
12	96	78	90	75	83	60	69	47	78	56	69	38	72	39	57	49	71	57	61	55	76	62	86	65
13	95	79	89	76	86	61	75	46	72	61	70	49	49	32	50	43	63	58	70	52	83	66	87	67
14	96	74	91	73	82	66	74	51	67	36	60	50	51	36	51	41	71	54	76	52	84	70	88	73
15	95	75	93	74	79	60	60	46	47	36	55	39	62	33	52	47	71	50	79	53	82	66	89	75
16	94	74	93	76	79	55	64	38	52	42	58	32	33	26	51	45	82	60	77	55	82	67	86	75
17	92	72	96	76	82	54	70	45	53	45	60	36	40	32	60	44	64	43	69	65	83	68	88	73
18	93.5	76	96	77	85	58	74	57	55	47	54	29	51	38	65	41	72	42	78	64	84	67	90	75
19	97	77	96	75	84	64	79	60	55	38	47	23	56	45	70	50	77	52	74	57	87	69	90	75
20	97.5	77	94	76	85	68	80	66	66	37	54	35	61	48	57	48	67	60	76	56	88	72	93	73
21	97	73	96	78	84	60	82	63	63	52	61	48	48	36	60	33	70	53	79	54	92	69	94	76
22	96.5	76.5	94	76	86	62	63	53	55	40	59	47	48	35	62	45	77	49	82	57	93	71	87	74
23	97	76	92	75	91	61	74	47	52	39	47	36	47	35	54	43	77	57	73	64	93	74	92	73
24	98	76	94	75	89	66	78	50	51	41	36	29	52	32	59	39	66	38	75	63	85	74	94	74
25	88.5	68	94	76	92	68	73	53	61	38	30	27	47	36	58	39	60	34	73	65	81	66	95	75
26	88	69	89	74	92	69	81	55	71	40	39	27	55	40	58	43	77	45	77	64	73	65	95	78
27	93	76	92	73	79	62	81	61	68	48	46	26	63	37	56	35	83	54	82	65	84	59	93	76
28	96	76	93	74	78	52	81	63	57	48	39	27	65	37	63	46	80	56	66	80	86	68	93	77
29	97	78	92	77	76	58	80	62	57	43	28	19	66	40	.....	.....	76	60	66	50	87	68	95	74
30	97	79	96	76	65	51	81	62	45	32	38	17	68	46	.....	.....	77	59	69	48	87	68	96	77
31	93	74	95	77	.....	.....	79	63	.....	.....	35	24	71	52	.....	.....	77	67	.....	.....	88	71	.....	.....
Range	30°		27°		43°		47°		46°		53°		55°		39°		52°		35°		46°		41°	
Monthly means	83°.6		83°.1		75°.3		64°.4		53°.1		41°.3		44°.1		52°.1		58°.3		65°.0		73°.6		80°.2	

Maximum, minimum, and mean temperatures—Continued.

STATION, SMITHVILLE, N. C.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	87	76	89	70	91	80	69	53	73	54	38	25	47	29.5	63	48	55	41	71	50	67	51	84	57
2	91	79	88	73	91	72	64	44	75	62	36	19	41	25	62	49	63	53	67	59	65	42	82	57
3	90	80	91	79	84	67	69	45	74	66	45	20	38	17	65	51	60	48	59	51	73	42	82	66
4	91	76	88	75	87	63	77	56	66	53	43	22	37	19	54	45	64	52	55	45	73	63	81	70
5	90	79	92	72	90	65	77	67.5	61	46	40	23	43	24	53	44	58	40	62	47	76	62	80	71
6	92	78	91	74	86	71	78	71.5	66	46	46	22	57	42	60	42	54	35	70	49	75	57	82	71
7	94	73	90	78	88	78	77	63	74	54	54	43	52	44	58	43	62	37	60	53	64	57	84	64
8	92	74	89	73	91	76	63	52	57	44	52	42	54	39	56	47	63	52	62	53	67	53	85	71
9	92	75	91	74	93	76	59	49	59	38	46	27	54	27	53	40	63	48	59	45	65	50	84	75
10	93	80	92	76	84	75	63	57	56	38	40	17	47	28	55	31	49	27	47	40	72	46	81	74
11	93	82	81	71	87	73	67	55	57	35	58	29	52	30	62	37	54	31	64	36	75	50	79	66
12	93	80	88	69	84	69	57	49	64	47	59	45	64	46	61	41.5	65	36	68	44	66	58	76	66
13	94	79	88	73	81	68	65	52	67	49	60	41	58	48	50	39	68	56	60	36	70	60	77	69
14	93	80	90	72	85	66	74	57	67	51	58	49	64	48	43	29	64	51	59	42	70	59	80	72
15	92	81	88	71	80	71	65	41	69	58	56	42	60	47	50	32	57	43	67	37	78	57	84	73
16	94	80	90	73	75	68	57	35	63	49	58	35	62	54	56	46	64	39	69	45	79	60	86	74
17	91	72	92	76	78	64	66	40	54	49	46	33	59	49	52	40	65	38	62	57	82	61	84	72
18	90	70	90	79	84	69	66	45	65	45	53	33	51	46	54	32	53	30	71	57	83	57	87	74
19	93	80	97.5	80	84	64	70	58	66	50	43	19	55	48	57	47	61	41	66	62	84	63	87	74
20	92	80	97.5	78	86	68	69	65	63	39	45	26	60	52	53	35	64	53	70	62	83	69	92	70
21	88	70	87	74	85	73	78	64	61	44	54	37	64	48	56	30	65	53	71	55	84	71	88	74
22	85	70	86	65	78	74	73	59	64	49	58	48	57	40	58	42	67	45	73	48	87	68	85	73
23	91	72	90	68	83	72	75	63	65	46	54	44	43	37	60	47	67	44	78	50	85	68	77	70
24	80	69	83	75	84	66	69	54	53	38	46	32	50	33	57	45	73	51	76	51	79	63	88	72
25	74	65	90	72	80	64	67	53	46	36	39	30	43	25	58	39	68	55	79	60	67	52	89	70
26	83	66	87	77	84	65	64	41	53	39	37	31	52	32	57	35	61	48	73	64	75	47	95	74
27	84	69	84	75	74	56	64	41	61	37	44	34	60	44	54	37	64	46	75	62	76	51	95	72
28	90	76	85	68	73	51	66	44	58	43	46	33	53	39	58	41	64	45	74	65	73	59	86	69
29	91	78	88	64	78	59	70	54	49	42	53	32	57	36	.....	.....	65	42	71	65	75	53	86	66
30	88	79	90	68	79	65	70	56	51	35	40	25	58	42	.....	.....	64	42	69	60	80	55	89	67
31	86	71	89	74	.....	.....	74	54	.....	.....	41	21	59	41	.....	.....	67	41	.....	.....	81	57	.....	.....
Range	29°		33°.5		42°		43°		43°		43°		47°		36°		46°		43°		45°		38°	
Monthly means	81°.6		80°.7		75°.5		61°.1		54°.0		40°.0		45°.4		47°.8		53°.0		59°.7		65°.4		76°.4	

Maximum, minimum, and mean temperatures—Continued.

STATION, SPRINGFIELD, MASS.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	84	65.5	(†)	(†)	90	60	59	44.5	66.5	42	20	8.5	35	19.5	48.5	36	45	31	50	39	65.5	48	87.5	59
2	92	71	81.5	58.5	75.5	62.5	62	39	71	49	28	6.5	26	12.5	48	37	47.5	26.5	51.5	40	53	38.5	88	60
3	88	75	81.5	55	74.5	54	64	35	64	48.5	36.5	26	28	10	47.5	34	47	34	48.5	35.5	56.5	35.5	88	60
4	92	71.5	81	56	78	48.5	66	49	57	39	37	25.5	19.5	5	43.5	29	46	28	59	39	57.5	41.5	79	66
5	88.5	73	87	63	66	52.5	55	48	51.5	34.5	40	21.5	26	4	43	26	39	25	42	36.5	62.5	35.5	72.5	58
6	82.5	69	91.5	69	72	44.5	69.5	44.5	52	26.5	41.5	19	26	0	40	28	34	22	48	32.5	64	40.5	66	52
7	85	60.5	92.5	71	72	48	60	46.5	47	40.5	45	25.5	41	25	48	25	45.5	24	52.5	37	65	37.5	65	58
8	92	69.5	87	71.5	69	57	58	35.5	52	43	38.5	30.5	41	25	41	26	49	24	54	35	63	45.5	76.5	50
9	94.5	74.5	85	62.5	68	54.5	53.5	35.5	55.5	40.5	35	15	25	6	35	17	56.5	28	55	40	52.5	43.5	77.5	63
10	88.5	70	88	61.5	68.5	50	63	38	47	32.5	15.5	5.5	21	2	37	15	32	23	57.5	39.5	52	40	78	60.5
11	89	72	86	63	68	51.5	50	37	50.5	41	15.5	5.6	32	11	44	22.5	40	18	58	34.5	58	43	70	55.5
12	90	72.5	86.5	63	74	58	56	31	49	40	36	6	35	6	46	23	38	31	48	34	68.5	39.5	75	52
13	93	71.5	86	60.5	71.5	50	62	35.5	57	40	45	30	21	4	27	9.5	40	32	55	31	72	42	77.5	58.5
14	91	74	85	69	72.5	53	62	36.5	48	39.5	44	31	28	4	37	16	37	23	57	32	76.5	45.5	82.5	63
15	88	69.5	91	69.5	75	60.5	44	33.5	43	37	35	21	21	11	41	11	32	24	60.5	30	82	50.5	84	62
16	87.5	65	84	66.5	69.5	52.5	50.5	35	45.5	31	38	6	36	17	46.5	32	37	21	64	33	80	57	79.5	67.5
17	90	68	72	68	58	50	52	39.5	47	23.5	15	2.5	28	11	39	20	31	21	62.5	46	84	62.5	79	65
18	92	71.5	79	64	74.5	51	54.5	33.5	47	36.5	22	4.5	32	5	32	16	27	15	53.5	44	88	66	80	55
19	92	70	80	63.5	72	60	61.5	30	45	39	28	8	40	17	33.5	19	29.5	9	46	39	83	63.5	85.5	65
20	91	69.5	83	56	68.5	57.5	60	35	44	37.5	20	8.5	45	27	32.5	16	38	16	48.5	41	80.5	60	75.5	56.5
21	84	69.5	67	49.5	64	54.5	69	47.5	47	38.5	17	3.5	29	20.5	46	25.5	45	25	52	41	70	58	74	56
22	84	61.5	76.5	49	68.5	59	68	54	46	38.5	25.5	10	20.5	17.5	52	24	51.5	40.5	66	41	74.5	54	70.5	55
23	73	62.5	77	58	68.5	48	66	59	46.5	35.5	32.5	22	31	12	50	26	56.5	39	75	39.5	66.5	48	73	50
24	76	57	80	56	62	56	64	46.5	43.5	35	22	5.5	29	— 3	39	35	52.5	37.5	75	41.5	52	42	78	54
25	73	56.5	82.5	66.5	66	55	57	43.5	43.5	29	24	0.5	23	6	41.5	33.5	50.5	34	66.5	51	58.5	41	86	63
26	73	54.5	78	60	61	51	55	43	38	25	31	18	30	12	42.5	32	51.5	36	64.5	45	63.5	47.5	77	63
27	77	49	74	56	58.5	43.5	47	37	41.5	27.5	33	23	44	27.5	42	28	58	45	66	39	65	48.5	71	61
28	82.5	64.5	76	57	63.5	44.5	46.5	31.5	44.5	31.5	30	3.5	32	19	45	21	49.5	32	59.5	44.5	77	46	77.5	58
29	80.5	66.5	79	53.5	68	48.5	48.5	28.5	41	30	38	13.5	35.5	24	.....	.....	36	27	57.5	44	81	51.5	76.5	59
30	76	59	80	56	63	49.5	54.5	22.5	33	15.5	39	23.5	41.5	17.5	.....	.....	45	30	65	42.5	80.5	54	79	58
31	70	58.5	83	56.5	.....	.....	58.5	29	.....	.....	31	22.5	41.5	12.5	.....	.....	52	30.5	.....	.....	85	55	.....	.....
Range	45°.5		43°.5		46°.5		47°		55°.5		45°.5		48°		42°.5		49°.0		45°		58°.5		38°	
Monthly means	76°.4		*72°.5		61°.1		48°.9		42°.7		23°.9		23°.9		34°.2		35°.9		49°.4		60°.1		69°.7	

* Mean of 30 days. † No observations taken.

Maximum, minimum, and mean temperatures—Continued.

STATION, SAINT JOHN'S, NEW FOUNDLAND.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	52	38	69	54	58	48	54	44	39	31	37	34.5	29	21	17	3	33	10	32	29	45	35	45	35
2	57	47	73	50	66	49	60	45	38	35	34	32	29	18	28	10	34	17	41.5	31	48	33	57	27
3	79	50	81	49	67	49	57.5	43	37	27	37	34	34	21	34	26.5	34	16	46	32.5	44	35	65	40
4	75	51	84	56	59	49	58	34	50	26	37	30	23	16	31	24	38	31.5	41	32.5	56	36	56	39
5	69	57	84	56.5	66	46	65	37.5	48	37	30	24.5	35	17	36	22	42	32	40.5	33.5	48	33	52	39
6	70	51.5	85	58	63	50	62	38.5	38	26	29	24	36	29	28	5	34	17.5	39	32.5	53	33.5	66	42
7	62	42	79	59	60	43	68	39.5	33.5	26	38	29	33	26	33	27	29	22	36	32.5	49.5	30	75	37
8	70	43	71	55	55	46	56	44	43	26	37	28	36	27	34.5	25.5	30	15	43	32	40	30	57	31.5
9	59	46	83	62	53	41	49	35	61	40	30	22.5	44	26	29.5	24	38	19	38	31	41	35	74	35
10	60	43	88	64	51	47.5	50	34	58	37	30	26	35	6.5	28	19	47.5	33	42	31	36	32	75	48
11	69.5	40	78.5	56	52	45	57	37	38	32	32.5	20	27	4	27.5	12	45	26	39	30	36.5	32	80	58
12	73	47	71	52	57	43	49	37.5	38	31	26	12	29	1	27	10	28	19	36	31	44	32	59	42
13	76	50	77	58	57	39	48	37	37	35	42	22	16	— 1.5	27	18	37	14	36	30	59	30	58	40.5
14	79.5	56	92.5	61.5	66	44	46	33	39	38	32	22	28	6	36.5	27	33	28	37	30	54	30	75	50
15	78	51	86	67	71	44	46	34	41	40	43	22	23	4	30	20	45	29	43	27	54	36	75	47.5
16	76	54	80	49	60	47	52	37	42	37.5	44	26	16	5	30	17	43	27	37	23	39	36	70	40.5
17	73	49	64	39	54	39.5	49	37	37	35.5	40	11.5	16	1	35	13	34	22	39	28	51	36.5	61	50
18	74	47	64	45	55	39	48	35	37	36.5	25	18	19	5	40	35	36	29	33	27	55	36.5	54	46.5
19	78	53	60	51	54	42	46	31	(†)	33	37	19	22.5	12	37	28	44	30	43	22.5	57	41.5	70	46
20	65	51	63	43	49	41.5	45	34	.....	32	31	20	38	9	39	26	33	26	46	27.5	47	33	63	43
21	79	60	56	44	64	37	43	30	.....	29	27	19	42	14	39	30	54	20	57.5	30.5	52	32	65	42.5
22	71	48	56	52	56	37	(*)	(*)	.....	22.5	30	24	16	8	34	29	46.5	20	53	33.5	49.5	34	60	43
23	56	45	63	46	56	37	.....	.....	.....	32	29	14	27.5	15	40	30	48	39	64	33	51	34.5	58	47.5
24	59	51	68.5	48	52	42	.....	.....	.....	32	25	15	27	11	40	32.5	52	32	69	34.5	53	34	64	42.5
25	80	53	67	48	53	42	.....	.....	.....	36	22	17	32.5	21	38	32	33	22	43	30	55	40	62	43
26	79	54	74	51	59.5	41.5	.....	.....	40	39	23	13	22	2	38	22	32	18	37	32	41	37	63	46.5
27	70	51	69	57	51	37.5	.....	.....	43	38	31	21	25	— 5	26	3	36.5	18	39	34	48.5	37	57	39.5
28	74	52	68	62	50	41	.....	.....	35	32.5	32	24	34	12	15	1	43	27	38.5	34	54	38	71	41
29	80	55	64	57	62	44.5	44	33	33	32	27	20	21	0	.....	.....	43	33	41.5	35	72.5	42.5	68	44
30	69	55	64	52	55	44	46	28	31	27.5	37	25	24.5	1	.....	.....	54	39	50	34	74	55	80	52
31	80.5	60	60	50	.....	.....	42	25	.....	.....	33.5	27	23	10	.....	.....	48	39	.....	.....	68	39	.....	.....
Range	52°.5		50°.5		34°.0		.....		.....		32°.5		49°.0		39°.0		44°.0		46°.5		44°.0		53°.0	
Monthly means	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* No forms received.

† No maximum reported on form 4.

Maximum, minimum, and mean temperatures—Continued.

STATION, STAYNOR, CANADA.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	74.8	45.4	82.7	51.4	67.8	54.4	.....	.....	57.7	49.4	18.9	0.5	21.9	9.5	42.7	33.5	43.7	18.5	.....	.....	39.7	30.5	86.7	55.4
2	(*)	.....	85.7	49.4	62.7	47.4	59.7	35.5	62.7	42.4	27	16.5	17.9	8.5	40.7	32.5	44.7	30.5	41.7	15.5	44.7	28.5	77	52.4
3	79.7	60.3	82.7	60.3	.....	.....	51.7	39.1	46.7	40.4	.....	.....	9.9	3.5	35.1	31.5	37	14.5	37.7	12.5	50.7	26.5	.....	.....
4	78.7	59.3	86.7	68.2	71.8	44.4	49.7	38.4	46.7	34.5	27	14.5	(†)	.....	.....	.....	.....	.....	44.7	19.5	47.7	29.5	77.8	44.4
5	73.8	59.3	90.7	68.2	62.7	40.4	51.7	32.5	.....	.....	30	19.5	19.9	— 1.5	33	14.5	24	5.5	44.7	31.5	59.7	25.5	73.8	39.9
6	78.7	60.3	.....	.....	69.8	36.4	56.7	39.4	49.7	32.5	32	23.5	32	0.5	37	30.5	29	— 0.5	43.7	25.5	.....	.....	71.8	42.4
7	87.7	59.3	89.7	60.3	69.8	54.4	44.7	33.5	45.7	32.5	30	25.5	.....	.....	37	20.5	27	9.5	39.7	23.5	58.7	30.5	77.8	41.4
8	87.7	67.2	78.7	54.4	68.8	49.4	.....	.....	40.7	32.5	21.9	9.5	30	0.5	28	4.5	24	9.5	.....	.....	54.7	30.5	85.7	53.4
9	.....	.....	84.7	49.4	67.8	48.4	52.7	29.5	38.7	31.5	12.9	— 5.5	12.9	— 8.4	34	13.3	17.9	11.5	55.7	22.5	53.7	34.5	78.7	44.4
10	93.7	68.2	90.7	54.4	.....	.....	52.7	32.5	39.7	29.5	.....	.....	21.9	10.5	40.7	19.5	19.9	3.5	52.7	23.5	54.7	37.4	.....	.....
11	83.7	64.3	89.7	59.3	67.8	45.4	42.7	30.5	41.7	29	14.9	—17.4	27	0.5	.....	.....	.....	.....	52.7	32.5	58.7	39.4	78.7	42.3
12	87.7	63.3	86.7	68.2	59.7	40.4	44.7	26.5	.....	.....	31	15.5	— 0.2	—25.4	48.7	8.5	31	7.5	44.7	30.5	63.7	34.5	78.7	47.2
13	84.7	63.3	.....	.....	64.7	36.4	51.7	41.4	52.7	25.5	39.7	24.5	16.9	—13.4	14.9	1.5	34	3.5	52.7	26.5	.....	.....	71.8	51.2
14	78.7	63.3	91.7	63.3	63.7	43.4	43.7	22.5	40.7	29.5	37.7	16.5	.....	.....	30	— 4.5	37	16.3	53.7	26.5	67.8	35.4	74.8	45.3
15	77.7	56.3	72.8	59.3	60.7	41.4	.....	.....	36	22.5	19.9	9.5	19.9	3.5	37	14.5	27	13.5	.....	.....	76.8	39.4	80.7	47.2
16	.....	.....	74.8	51.4	68.8	36.4	46.7	31.5	38.7	27.5	22.9	— 7.4	11.9	7.5	37.7	18.5	27	1.5	54.7	30.5	79.7	54.4	70.8	44.3
17	89.7	53.4	72.8	58.3	.....	.....	40.7	29.5	41.7	33.5	.....	.....	20.9	— 0.5	24	7.5	12.9	— 9.4	55.7	33.5	73	55.4	(‡)	(‡)
18	85.7	64.3	80.7	60.3	61.7	52.4	51.7	21.5	43.7	36.4	14.9	— 8.4	28	4.5	.....	.....	.....	.....	58.7	42.4	79.7	61.3	.....	.....
19	89.7	58.3	80.7	53.4	61.7	49.4	62.7	26.5	.....	.....	14.9	3.5	34	22.5	24	2.5	26	— 7.4	45.7	36.4	77.7	51.4	.....	.....
20	82.7	59.3	.....	.....	(†)	(†)	61.7	36.4	45.7	39.1	5.8	— 7.4	37.7	6.5	35	2.5	34	1.5	52.7	34.5	.....	.....	.....	.....
21	68.3	48.4	67.8	43.4	69.8	46.4	70.8	42.4	41.7	38.4	14.9	— 1.5	.....	.....	44.7	32.5	36	20.5	65.7	32.5	87.7	52.4	.....	.....
22	61.7	49.4	76.8	43.4	65.7	50.4	.....	.....	41.7	32.5	24	13.5	25	4.5	50.7	31.5	37.7	23.5	.....	.....	59.7	41.4	.....	.....
23	.....	.....	84.7	60.3	66.7	51.4	66.7	44.4	30.4	29.5	17.9	9.5	17.9	8.5	37	29.5	37.7	15.5	78.7	36.4	44.7	34.5	.....	.....
24	64.7	49.4	88.3	60.3	.....	.....	50.7	38.4	35	29.5	.....	.....	15.9	7.5	37	19.5	37.7	13.5	57.7	39.4	48.7	34.5	.....	.....
25	65.7	44.4	76.8	51.4	74.8	49.4	44.7	35.5	34	28.5	14.9	— 9.4	17.9	4.5	.....	.....	.....	.....	49.7	31.5	59.7	39.4	78.7	34.5
26	69.8	45.4	77.7	49.4	54.7	43.4	39.7	31.5	.....	.....	25	3.5	37	15.5	29	20.5	35	23.5	60.7	26.5	70.8	37.4	78.7	53.2
27	75.8	51.4	.....	.....	49.7	42.4	39.7	30.5	34	20.5	22.9	16.5	33	4.5	30	13.5	32	24.5	56.7	32.5	.....	.....	75.8	51.2
28	67.8	54.4	71.8	41.4	54.7	39.4	38.7	25.5	35	18.5	28	17.5	.....	.....	34	18.5	32	15.5	55.7	39.4	75.8	50.4	77.7	52.2
29	77.7	52.4	76.8	52.4	52.7	35.5	.....	.....	32	20.5	16.9	0.5	38.7	4.5	.....	.....	35	14.5	.....	.....	78.7	44.4	74.8	50.2
30	.....	.....	81.7	57.3	51.7	32.5	50.7	23.5	21.9	0.5	18.9	10.5	34	15.5	.....	.....	31.1	19.5	45.7	37.4	80.7	57.3	80.7	51.2
31	81.7	52.4	86.7	60.3	.....	.....	59.7	43.4	.....	.....	.....	.....	44.7	26.5	.....	.....	49.7	29.5	.....	.....	84.7	54.4	.....	.....
Range	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Monthly means	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* No observations taken on Sundays.

† No observation taken.

‡ Form 4 for week ending June 23 missing; no reports taken.

Maximum, minimum, and mean temperatures—Continued.

STATION, SAINT LOUIS, MO.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	85	67	84	68	78	68	55	42	77	64	20	4	24	13	69	50	47	39	65	40	59	41	84	65
2	80	69	84	68	71	59	69	42	67	44	24	5	21	8	56	44	47	37	43	27	51	42	84	65
3	91	70	85	72	81	61	58	45	50	39	29	12	26	11	48	35	49	18	57	32	47	43	75	63
4	89	65	83	70	83	69	56	44	52	42	34	24	42	19	46	32	32	14	65	45	62	38	74	65
5	83	67	85	70	83	68	61	44	62	43	45	24	42	29	40	28	40	26	70	39	60	49	75	61
6	92	77	88	73	83	69	60	46	55	39	47	33	43	32	49	34	55	30	61	50	55	46	79	60
7	92	77	86	72	90	74	59	37	42	30	47	31	35	13	53	38	57	36	61	48	56	48	81	67
8	89	77	84	73	90	76	58	44	42	31	40	3	13	— 4	47	36	55	18	52	40	64	45	82	69
9	89	76	83	72	89	68	66	42	49	37	11	— 5	28	1	50	33	23	9	47	39	67	48	69	48
10	86	75	79	73	68	62	58	44	58	37	37	9	35	21	58	37	41	16	58	45	68	50	77	49
11	90	78	84	72	68	61	53	34	67	42	55	28	52	32	58	42	43	33	63	45	61	52	72	56
12	85	77	85	74	69	59	61	38	70	53	60	36	32	14	52	29	52	36	64	50	69	52	80	54
13	87	75	89	73	72	62	74	47	62	34	50	38	27	10	36	28	42	32	60	43	69	57	87	65
14	89	75	86	74	63	54	63	37	38	33	38	18	34	22	44	30	39	28	61	38	78	60	86	69
15	87	77	86	74	69	54	45	31	41	30	45	12	43	23	53	31	41	23	74	48	82	63	87	71
16	91	75	90	75	71	55	61	34	44	35	44	4	23	9	47	38	45	29	80	60	77	64	89	72
17	93	77	89	75	72	56	69	42	47	40	27	13	40	20	50	34	39	22	73	59	86	67	86	70
18	92	75	91	77	77	58	73	50	47	25	22	2	46	35	66	34	50	32	71	54	85	70	93	70
19	94	80	92	71	78	59	65	55	36	22	37	18	50	39	58	34	53	36	65	51	87	68	91	73
20	92	80	83	73	70	62	71	59	45	31	43	23	46	21	48	27	67	30	63	49	85	71	91	72
21	85	72	85	70	72	64	66	56	47	32	43	23	37	19	65	31	53	31	68	47	87	66	82	69
22	88	73	90	71	74	63	66	51	42	23	37	20	37	23	53	44	71	41	77	51	78	65	80	65
23	81	65	92	76	79	64	65	49	45	31	24	13	32	10	44	33	59	32	81	60	71	53	84	64
24	74	57	92	80	80	65	58	48	51	32	19	11	31	19	35	29	32	24	65	54	69	51	86	65
25	78	64	80	67	76	63	58	40	47	31	21	13	48	22	33	28	33	19	67	50	69	47	92	71
26	82	66	76	61	67	55	62	45	38	30	21	13	51	32	45	28	50	27	62	54	71	55	84	66
27	88	72	78	61	65	48	78	48	45	31	24	15	50	31	48	28	49	35	76	53	74	58	87	69
28	84	73	80	64	70	54	80	65	39	23	26	17	57	33	50	32	49	35	58	44	78	58	83	66
29	82	68	89	67	56	43	79	66	33	27	19	10	57	38	.....	.....	54	31	44	39	83	64	89	71
30	83	68	87	71	50	43	81	64	27	15	21	4	65	48	.....	.....	59	48	54	35	85	65	89	74
31	83	67	88	71	.....	.....	79	66	.....	.....	34	17	66	53	.....	.....	76	55	.....	.....	85	67	.....	.....
Range	37°		31°		47°		50°		62°		65°		70°		42°		67°		54°		49°		45°	
Monthly means	79°.2		77°.8		66°.8		55°.7		40°.6		25°.1		31°.5		41°.7		38°.6		54°.6		*63°.7		74°.6	

*30 days, means.

Maximum, minimum, and mean temperatures—Continued.

STATION, SAINT MARK'S, FLA.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	90	71	90	70	91	72	67	47	79	54	41	28	60	36	67	44	67	57	74	57	71	53	92	60
2	92	73	89	69	93	71	66	38	77	60	41	21	49	28	69	43	66	52	75	57	77	46	93	56
3	92	73	89	72	92	74	71	35	78	60	47	21	53	28	69	47	66	44	74	62	76	47	88	63
4	91	73	88	70	92	70	79	44	74	51	47	20	50	28	68	60	72	53	77	64	74	58	86	59
5	95	71	89	73	92	67	76	52	74	57	45	25	50	29	68	54	73	49	77	54	81	66	85	64
6	92	73	93	73	91	68	80	63	75	60	49	19	67	50	64	50	63	40	78	53	80	63	89	74
7	93	71	90	71	92	67	71	63	69	50	59	34	54	41	60	53	66	39	76	54	83	66	89	67
8	91	69	93	70	89	73	64	56	59	36	57	43	63	39	68	47	68	48	77	65	75	59	88	69
9	95	71	91	73	89	73	56	52	57	35	52	31	44	27	68	45	67	43	73	61	76	51	87	74
10	98	72	93	74	90	72	63	54	56	34	57	29	56	27	62	48	54	33	65	50	79	51	86	74
11	95	74	91	73	90	73	77	63	60	29	64	42	62	29	66	38	65	35	68	48	81	58	76	69
12	95	72	93	70	86	71	69	53	66	33	64	43	71	53	69	47	69	46	63	50	86	62	86	70
13	92	73	93	74	87	71	68	51	71	39	63	34	72	49	71	52	72	50	67	53	85	63	82	73
14	94	72	90	72	89	69	74	61	73	45	63	48	65	58	56	42	73	58	65	49	86	64	81	73
15	94	71	90	71	90	69	77	59	76	50	62	48	62	57	47	40	67	48	72	45	83	62	82	72
16	94	72	88	71	88	64	70	54	74	56	62	37	66	61	61	44	65	40	74	50	84	61	87	73
17	97	72	89	72	86	64	74	52	74	57	68	35	68	60	58	42	74	45	72	53	83	59	90	71
18	94	73	93	71	87	59	78	54	76	57	64	42	75	62	63	33	62	34	72	58	82	65	89	69
19	94	68	96	76	86	59	82	65	63	42	53	28	74	57	69	43	65	37	75	65	88	70	90	70
20	92	72	98	76	82	59	81	67	63	32	59	26	68	58	61	46	70	43	78	56	87	71	94	73
21	96	74	95	75	79	70	80	61	67	36	62	39	68	59	57	31	69	52	81	57	89	68	91	72
22	95	73	94	73	84	67	78	65	72	36	65	56	67	61	60	38	66	44	82	58	89	67	88	71
23	90	71	93	71	86	62	73	55	71	43	63	51	71	53	63	46	69	39	81	55	93	72	86	72
24	92	72	92	71	87	65	72	49	58	46	64	51	55	41	62	44	72	49	77	53	90	66	93	72
25	83	74	91	68	89	68	74	52	49	40	52	45	56	31	64	40	64	43	80	54	89	61	92	71
26	83	72	93	71	90	63	73	45	63	36	45	42	64	39	64	42	66	40	77	55	86	64	93	74
27	92	71	93	72	84	67	75	46	69	37	52	43	66	44	71	47	78	45	77	66	82	59	93	72
28	91	73	91	72	83	62	74	48	72	52	58	44	64	37	72	49	82	51	71	61	71	60	98	77
29	91	72	90	72	84	62	74	47	72	57	61	31	66	33	.....	.....	72	49	77	66	82	63	96	74
30	90	73	93	71	83	61	76	48	63	37	39	23	68	39	.....	.....	72	52	75	56	87	60	94	74
31	93	72	92	71	.....	.....	78	50	.....	.....	49	25	68	42	.....	.....	73	55	.....	.....	90	58	.....	.....
Range	30°		30°		34°		47°		50°		49°		48°		41°		49°		37°		47°		42°	
Monthly means	81°.4		80°.3		76°.6		62°.8		54°.9		44°.9		52°.3		53°.8		57°.7		64°.8		71°.5		78°.9	

Maximum, minimum, and mean temperatures—Continued.

STATION, SAINT MICHAEL'S, ALASKA.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	56	50	54	47	57	46	39	26	38	26	.....	—16	.....	—22	.....	—36	.....	— 1	.....	30	.....	29	.....	35
2	57	47	54	47	56	45	38	34	36	30	.....	—20	.....	—20	.....	—41.5	.....	9	.....	28	.....	28	.....	37
3	60	42	52	45	59	50	39	36.5	32	23	.....	—18.5	.....	—20	.....	—39	.....	24	.....	28	.....	16	.....	37
4	59	46	50	38	53	46	43	35	25	14	.....	—24	.....	—26	.....	—29	.....	9	.....	26	.....	18	.....	37
5	52	40	50	38	52	47	41.5	36	18	— 5	.....	—23	.....	—32	.....	—29	.....	1	.....	26	.....	24	.....	38
6	58	39	57	34	50	45	38	32	3	— 5	.....	—23	.....	—32	.....	—34	.....	— 1	.....	20	.....	32	.....	36
7	58	45	64	46	54	45	38	28	16	— 9	.....	—15	.....	—32	.....	—29	.....	— 6	.....	16	.....	31	.....	36
8	58	47	63	50	53	44	41	33	21	10	.....	9	.....	— 3	.....	—36	.....	— 3	.....	29	.....	25	.....	42
9	58	47	53	47	50	46	38	33	32	19	.....	8	.....	5	.....	—40	.....	3	.....	22	.....	34	.....	43
10	61	50	55	45	51	45	38	34	31.5	27	.....	0	.....	— 5	.....	—39	.....	10	.....	26	.....	31.5	.....	40
11	61	43	53	45	54	47	37	33	31.5	10	.....	—25	.....	— 3	.....	—36	.....	5	.....	22	.....	26	.....	39
12	58	49	53	47	54	44	37	33	15	6	.....	—22	.....	8	.....	—31	.....	4	.....	18	.....	29	.....	45
13	62	49	53	42	57	45	39.5	33	15	— 2	.....	— 5	.....	28	.....	—41	.....	18	.....	16	.....	33	.....	45
14	68	52	52	41	54	48	40	35	16.5	— 1	.....	—23	.....	25	.....	—41.5	.....	8	.....	28	.....	31.5	.....	39
15	68	55	54	39	53	44	37	28	19	4	.....	15	.....	— 4	.....	—41.5	.....	2	.....	19	.....	21	.....	40
16	59	49	56	38	50	39	30	20	16	0	.....	24	.....	— 7	.....	—37	.....	— 1	.....	16	.....	29	.....	48
17	58	47	58	49	49	36	29	22	16	4	.....	— 5	.....	26	.....	—40.5	.....	— 2	.....	5	.....	25	.....	49
18	55	46	52	42	47	41	31	26	10	— 7	.....	— 9	.....	27	.....	—46.5	.....	— 6	.....	— 1	.....	24	.....	51
19	51	43	50	43	46	38	31	26	18	— 2	.....	— 9	.....	22	.....	—50	.....	—14	.....	— 3	.....	30	.....	51
20	56	46	50	44	44	38	30	26	22	1	.....	8	.....	19	.....	—50	.....	—13	.....	2	.....	36	.....	51
21	55	45	51	44	44	37	30	26	4	— 2	.....	— 5	.....	19	.....	—45	.....	—15	.....	15	.....	33	.....	50
22	52	41	52	43	41	34	30	24	(*)	—12	.....	23	.....	3	.....	—42	.....	—11	.....	36	.....	31	.....	48
23	56	45	54	42	40	29	32	23	.....	—15	.....	20.5	.....	—14	.....	—31.5	.....	—15	.....	33	.....	35	.....	44
24	57	45	54	39	40	29	32	22	.....	— 8	.....	1	.....	—16	.....	—35	.....	—16	.....	32	.....	32	.....	46
25	56	45	56	39	44	36	29	25	.....	—18.5	.....	0	.....	—22	.....	—26	.....	— 5	.....	28	.....	35	.....	49
26	61	46	53	44	43	36	29	22	.....	—20.5	.....	—22	.....	—29	.....	—28	.....	— 5	.....	22	.....	40	.....	51
27	62	51	55	46	44	33	28	18	.....	—23	.....	—26	.....	—25	.....	—22	.....	— 6	.....	19	.....	35	.....	43
28	62	48	54	43	42	37	21	16	.....	—24	.....	—22	.....	—22	.....	— 3	.....	18	.....	31	.....	37	.....	40
29	61	49	54	42	42	31	29	16.9	.....	—23	.....	—18	.....	—36	.....	.....	.....	29	.....	31	.....	37	.....	47
30	59	43	53	40	39	33	12	8	.....	—15	.....	—20	.....	—39	.....	.....	.....	31.5	.....	24	.....	36	.....	45
31	55	46	54	43	.....	.....	28	9	.....	.....	.....	—22	.....	—39	.....	.....	.....	27	.....	.....	.....	40	.....	.....
Range	23°		30°		30°		35°		.....		.....		.....		.....		.....		.....		.....		.....	
Monthly means	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* Maximum thermometer broken.

Maximum, minimum, and mean temperatures—Continued.

STATION, SAINT PAUL, MINN.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	68	58	84	66	72	53	56	32	49	35	13	— 6	8	—11	42	37	45	35	53	17	60	37	68	57
2	79	56	87	68	71	46	73	39	41	35	15	— 4	8	—13	38	20	35	14	33	9	63	39	69	52
3	82	61	87	65	77	56	50	36	40	34	18	7	9	—13	44	20	20	5	37	24	63	41	72	50
4	84	61	88	66	71	52	45	34	48	34	20	7	23	— 4	48	31	24	10	38	31	65	41	72	52
5	82	56	85	66	60	54	55	27	47	39	36	10	27	18	44	26	23	3	55	28	65	45	75	52
6	91	63	77	63	65	53	45	35	47	25	32	23	34	7	44	32	29	10	44	29	60	50	76	63
7	93	76	85	57	75	58	47	32	(†)	(†)	25	7	7	— 8	43	26	15	3	63	38	68	42	77	62
8	93	75	88	62	62	48	46	23	46	19	9	—22	— 3	—24	40	21	17	— 8	60	39	66	41	73	46
9	84	(†)	87	65	58	51	70	32	49	29	0	—27	13	—17	43	23	16	— 9	63	38	70	42	56	37
10	84	57	80	61	57	51	42	28	60	35	12	0	8	—15	49	30	27	0	59	37	75	41	59	40
11	92	(†)	76	54	58	50	47	22	52	38	41	— 2	8	—12	41	10	37	16	64	36	73	48	55	44
12	87	71	89	58	67	42	59	38	44	36	41	22	5	—15	29	5	39	22	62	36	73	49	64	39
13	80	66	91	66	60	51	55	36	36	15	40	30	23	—14	34	18	43	18	64	37	75	48	74	45
14	79	60	73	61	66	47	42	25	31	10	32	— 4	18	4	35	18	26	5	64	42	69	55	73	47
15	87	(†)	67	57	69	44	46	21	37	20	40	—17	11	—15	42	30	32	4	62	42	77	59	67	49
16	84	65	72	60	70	49	58	32	36	32	— 5	—22	0	—18	32	16	28	10	61	40	83	60	82	50
17	86	(†)	76	64	71	57	62	33	35	31	1	— 5	18	— 7	40	16	29	7	56	47	80	60	85	62
18	89	68	81	64	73	55	67	47	34	23	16	—11	18	2	50	30	30	10	52	47	71	60	87	64
19	93	71	82	62	69	62	60	50	32	23	9	— 7	14	— 8	43	31	34	16	60	41	79	66	75	52
20	81	62	75	55	66	57	57	50	37	26	18	4	15	— 9	50	23	36	21	65	38	72	61	84	60
21	(†)	(†)	70	56	69	50	56	46	35	18	20	10	24	0	52	31	40	26	65	43	65	52	77	54
22	70	57	90	68	76	56	48	43	25	9	15	— 4	12	—10	43	26	32	16	73	49	68	46	77	53
23	76	47	84	73	74	53	52	33	23	15	8	— 5	22	— 8	32	21	25	4	64	43	70	46	79	63
24	79	51	82	59	70	52	43	36	29	18	14	—11	18	— 2	31	10	37	5	55	36	73	43	79	63
25	84	54	71	50	66	48	43	31	28	20	18	0	25	1	35	22	37	8	62	40	78	51	75	57
26	80	59	72	45	59	40	44	25	33	20	27	— 1	35	10	39	22	41	28	56	45	80	55	78	60
27	82	66	77	51	65	37	54	35	27	15	8	—11	36	19	43	19	47	33	46	33	78	58	75	59
28	84	60	69	60	58	43	56	38	22	3	19	— 2	42	21	43	22	50	29	39	32	79	58	80	57
29	86	60	75	59	46	36	55	46	20	11	15	3	38	15	.....	.....	48	33	45	30	84	60	80	61
30	88	64	83	66	50	36	58	45	15	1	7	—16	39	31	.....	.....	45	37	54	28	82	68	72	62
31	89	65	72	58	.....	.....	54	39	.....	.....	15	— 7	40	33	.....	.....	53	38	.....	.....	76	62	.....	.....
Range	.....	.....	46°		41°		52°		.....		68°		66°		47°		62°		64°		47°		50°	
Monthly means	.....	.....	69°.9		56°.8		43°.2		*29°.6		8°.4		10°.0		32°.0		23°.7		46°.2		62°.0		63°.7	

* Mean of twenty-eight days.

† Observer sick.

Maximum, minimum, and mean temperatures—Continued.

STATION, SYDNEY, C. B.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	70	51.6	73	53.6	65.6	50	63	42	43	35	37.9	21.4	19.6	14	29.6	13.7	36	15	32.9	27	42.5	36.5	60.3	41.4
2	69.3	48.2	72.3	48.4	69	55	58	43.4	42.5	31.3	39	33	31	13.4	32.4	27.5	34	7.5	37.7	27	42.5	34.6	61.7	36.6
3	73.4	54	78.3	47	66.2	55	57	37	51	38.8	38.9	31	29.9	5.4	34	22.7	38.8	25.2	45.8	33.3	51	34.7	79.6	46.4
4	79.2	58	83.9	59	64.4	53.8	58.3	31.1	55	36.8	36.5	24.2	18.8	1.8	33.3	19	39	25.3	36.6	30	53	36	63.4	50.2
5	75	54	82	61.6	68	52.2	66.7	49.5	39.7	32	35.8	25.3	31.4	5.9	38	22.3	37.5	13.1	38	31.6	58.9	33.4	64.8	45.4
6	72	53	85.2	61	61.3	44.8	60.1	44.5	36.4	26.4	34	28	27	10	31.7	23.5	25.8	11.2	41.4	34.3	63.4	30.2	72	44
7	74.5	53	86.4	61.3	55.4	47.7	61.4	50.4	40	21.6	41	28	38.8	13.4	34.7	26.5	33	9.1	45.2	34	44	35.3	76.9	48.7
8	64	50.8	85	65.6	58.7	44.8	51.9	37.5	55	38	38.4	25	39.4	30	29.9	14.4	29.4	17.3	39.5	31.2	42.5	36.2	61	43
9	61	48	82.1	63	54.6	45	49.7	34	60	53.8	33	23	42.5	16	27.7	8.7	51.4	23.4	37.8	31	43	38	63.5	47.5
10	69	50	87.8	63.6	51.8	48.1	51.8	33	60.2	40	31.9	19	16	5.2	23.2	—4.8	48	26	39.7	32.1	37.7	33	74.6	52.7
11	73.7	51.8	90	64.3	55.4	43	58	39.4	44.6	38.6	19	3	25.8	14.8	21.5	—11	27	13.3	38	31	39	32	76.8	57
12	78.3	53	89.9	64.8	59.9	40	44.8	35.5	45	38.4	34.4	— 2	25	— 2.8	27.6	—12.8	33.7	9.2	33	28.4	53	32.6	62	49.4
13	82.2	56.6	85	58	61	37.5	53.3	35.8	49.4	40.4	34.6	24.4	10.3	— 9.8	36.7	25.3	35	25	34	26.2	62	29	66.3	50.7
14	76.4	54	86.6	61.5	68.9	37.6	47.9	31.5	44.8	39.5	38.6	25	28.6	— 0.5	28.4	14.7	33.8	25.2	47.8	24	70	29.7	79	57.1
15	74	52	84.3	64	65.8	46.3	51	38.8	41.8	39	38	26.2	5.6	— 7.6	26	13.6	39.3	28.5	49.4	24.1	54.2	39.2	70.3	49.6
16	73	47.3	70.6	53.9	61	40	55	35	40	34	38.4	13.8	18.8	4	37.7	15	39.3	19.4	42.8	24.4	53.4	34.4	76.8	49.4
17	72	47.5	65	50.5	57.6	37.7	47.7	37.2	36	30	13.8	— 1	12.6	—15	43	19.7	35	12	45.9	27.2	55	34.4	69.9	48.6
18	74	60	71.5	53	63.3	38.5	44.7	36.5	35	30	21	6	19.7	—15.5	35.5	23	41.7	20.8	45.2	25.2	46.3	33	63	48.3
19	80	60	66.8	47	62.1	40	44.4	29.5	34	31	41.7	21	23.4	— 2.4	28.8	22.8	44	18.3	55.4	23.7	45	35.7	75.5	51.7
20	78	54.2	71	45.3	50.5	40.8	50.9	29.3	39.6	27.6	22.8	13.4	40.5	0.5	37.2	15.3	29.8	7.4	38.8	30.7	47	34	60.6	46.7
21	79.8	57.1	61.8	47	57	33.4	45.9	27.6	37.9	26.4	21.9	10.2	39.6	— 0.2	30.1	2	36.4	4.7	55.1	35	49.8	37.3	61.3	44.6
22	69	45	66	44.4	65	30.6	46	26.3	37.6	32.3	22.8	12.4	22	— 4.7	29.7	0.2	45.6	32	53	30.3	53	33	65.1	47.3
23	65	41.5	61.9	48.2	66.4	43.2	59.2	43.4	39	32.5	24.2	11	31	6.6	35.9	27.7	45.8	30.8	62.3	27.6	59.7	28.4	60	45.7
24	62	53.6	61.9	48.5	59.8	45.5	51.7	42	41.8	36.3	26	16.4	23.8	— 4.7	41.9	31.4	42	27	67.8	31.3	48.4	38	65	46.7
25	73	56.8	65	45.4	65	43.5	65	46.5	41	38.5	24.2	20.2	18.4	— 3	35.9	31	28.4	18.4	45.6	34.8	52	40.4	66.6	50
26	73.5	51.8	69	54	54.9	44.4	53.3	42	41	36.5	27.7	21.4	1.4	—14.8	33.6	14	35	18	45.9	35	45	40	60	41.4
27	69	54	72.8	53.4	52	46.5	53.2	37.8	41	32	26.9	21.4	20	—14.8	16.3	1.8	40.1	22.4	44.6	33.4	49	35.4	64.8	58.3
28	76	51.4	70.3	50.2	62.7	43.4	45.4	36.3	36	27.5	26	16.6	13	—17.6	25	10.2	45.7	37.3	48.7	35	64.6	37.1	69.6	35.4
29	69	53.7	65	44	63.9	42.3	39.8	32.4	33.7	28.4	23.6	20.2	13.3	—25	.....	.....	51	38.2	52	33.4	81.4	51	72.9	40
30	74.8	54.9	60.4	50.8	52.9	47.2	43	32.3	29.6	21	37.3	21.5	28.7	— 8	.....	.....	45.3	30.8	53	31	83	55.5	72.9	43.3
31	74.5	54	60	51.4	.....	.....	44.2	36.3	.....	.....	30.6	18.8	34.8	4.6	.....	.....	37.5	28.2	.....	.....	83.6	46.4	.....	.....
Range	40°.7		46°.0		38°.4		40°.4		39°.2		43°.7		67°.5		55°.8		43°.3		44°.1		55°.2		44°.2	
Monthly means	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, THATCHER'S ISLAND, MASS.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	81	62	75	58	77	61	59	47	56	47	23	9	29	17	45	34	43	26	45	37	48	44	82	62
2	81	63	78	60	71	55	62	46	57	46	35	6	29	15	45	35	42	29	42	36	46	39	75	54
3	82	63	77	57	73	53	64	46	62	45	39	28	21	7	38	33	47	35	40	36	53	36	75	56
4	77	63	77	59	73	55	66	52	54	37	38	27	15	2	44	32	47	30	41	34	54	39	75	59
5	81	62	80	61	63	51	54	46	49	41	40	28	21	5	41	29	35	24	37	33	58	38	73	57
6	77	63	82	65	72	47	62	48	49	41	40	25	36	10	38	28	31	22	45	33	46	42	65	54
7	73	61	83	65	72	53	58	43	51	42	40	29	42	35	41	28	45	20	47	35	55	41	60	53
8	86	59	85	66	64	58	55	38	48	45	35	31	40	32	35	29	42	28	45	33	56	41	59	53
9	72	59	83	66	59	52	55	36	49	41	37	12	40	14	33	21	48	26	47	36	44	40	69	53
10	72	57	83	65	67	52	57	45	47	41	15	5	29	15	38	21	31	22	50	37	43	38	67	55
11	81	60	81	65	70	51	52	36	46	42	30	3	31	17	43	28	34	17	53	39	58	41	63	54
12	83	64	81	64	72	54	56	32	46	40	36	27	31	14	44	30	38	30	41	30	63	42	69	53
13	86	68	81	64	68	56	57	40	48	40	44	25	32	11	31	15	38	29	54	32	64	45	70	56
14	78	62	80	65	68	56	58	47	45	37	43	36	28	14	33	16	36	28	52	38	74	56	72	56
15	81	62	77	62	72	58	54	29	43	38	46	21	33	13	40	24	35	24	52	35	73	58	77	59
16	83	62	70	63	60	53	47	30	40	36	41	3	35	20	43	33	30	19	53	37	65	52	67	58
17	82	66	67	62	57	54	47	39	46	34	9	— 3	22	15	38	20	29	24	48	40	69	46	76	61
18	79	64	77	61	63	56	51	35	47	40	41	8	33	15	33	16	27	17	52	40	67	45	75	59
19	82	64	73	62	63	54	54	36	44	40	23	6	37	28	29	16	23	13	42	39	70	53	84	58
20	83	67	74	58	56	51	54	43	45	39	16	3	42	32	29	14	35	18	44	39	62	52	69	55
21	84	64	64	53	54	51	51	47	45	39	26	2	36	21	42	20	42	28	52	41	61	46	68	52
22	74	62	69	53	61	50	56	48	41	38	34	21	32	22	45	31	46	40	45	39	55	47	67	53
23	69	59	69	58	65	51	55	49	42	36	31	18	30	18	38	31	42	35	60	41	63	48	69	49
24	75	58	72	57	56	54	65	48	42	35	23	11	24	10	36	31	43	34	56	43	50	46	69	52
25	74	58	75	61	56	53	56	41	39	31	29	12	16	4	36	32	40	34	58	41	57	45	84	54
26	71	58	78	63	59	52	52	40	36	28	35	25	31	11	39	32	44	34	62	44	59	46	67	55
27	74	55	70	59	59	45	46	37	40	25	33	21	42	30	35	30	46	41	63	46	64	46	71	53
28	72	62	73	55	62	48	46	31	40	28	30	16	32	20	39	26	43	38	50	43	65	46	70	52
29	79	61	73	53	62	55	47	30	37	28	40	26	32	24	.....	.....	40	31	45	41	72	50	69	54
30	73	59	74	57	61	51	50	32	30	23	40	18	41	24	.....	.....	37	30	56	41	70	52	68	51
31	60	57	76	58	.....	.....	55	38	.....	.....	27	19	39	28	.....	.....	50	34	.....	.....	73	53	.....	.....
Range	31°		39°		32°		37°		39°		49°		40°		31°		37°		33°		38°		35°	
Monthly means	68°.3		66°.8		58°.3		47°.8		42°.1		25°.1		25°.0		32°.3		34°.7		43°.0		52°.6		62°.1	

Maximum, minimum, and mean temperatures –Continued.

STATION, TOLEDO, OHIO.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	80	63	80	60	75	62	53	38	72	60	27	16	25	18	55	42	42	26	69	42	42	34	84	64
2	84	71	80	65	68	52	59	41	65	45	34	24	28	12	54	43	50	34	42	32	52	33	84	66
3	84	67	76	64	72	54	55	44	49	41	33	24	19	10	45	36	41	31	34	25	59	38	79	68
4	78	68	82	69	73	60	50	39	51	40	34	25	21	11	38	30	31	18	50	32	58	41	79	64
5	80	69	74	68	63	48	54	40	53	42	34	21	30	17	40	26	31	18	53	36	54	46	63	58
6	84	65	82	69	61	56	55	45	55	37	40	25	42	25	41	35	37	14	58	36	55	43	71	55
7	90	72	82	70	76	61	51	39	45	35	36	25	38	27	46	35	37	21	46	33	52	47	76	60
8	92	74	81	63	72	66	47	36	43	33	30	8	27	14	38	26	37	22	41	35	56	44	80	63
9	93	76	80	65	67	60	55	29	45	32	8	— 4	18	— 2	34	23	25	13	46	36	55	44	70	57
10	91	76	85	70	55	59	52	39	45	28	16	— 3	30	16	51	28	28	9	52	37	57	39	65	49
11	81	70	79	71	64	58	47	30	51	34	34	4	41	22	56	37	41	21	57	37	57	45	69	50
12	89	73	83	72	65	53	51	31	57	37	42	32	22	3	49	34	36	26	52	35	59	45	73	53
13	86	73	84	70	63	45	58	34	61	49	47	38	24	8	28	17	36	18	48	36	64	44	79	52
14	80	71	87	70	68	55	50	32	49	32	42	19	30	19	35	19	38	25	51	33	68	45	84	62
15	79	64	81	68	66	52	44	25	41	32	35	10	27	21	43	27	32	17	58	37	75	57	76	68
16	78	60	77	60	65	51	57.5	31	42	33	35	1	28	20	41	32	28	14	70	46	80	62	76	66
17	88	66	77	67	63	56	54	39	46	36	16	6	32	14	34	23	19	4	60	45	82	67	73	58
18	90	75	84	67	71	54	55	36	48	39	21	7	41	21	46	23	30	12	51	45	86	68	86	60
19	90	73	80	69	73	52	60	43	50	43	23	9	42	35	43	26	25	17	65	43	87	69	76	62
20	90	74	71	60	74	59	69	51	46	42	24	5	39	14	41	17	33	8	57	41	82	68	80	58
21	74	63	71	48	67	63	74	56	50	42	37	20	28	6	56	33	40	24	63	43	79	65	80	68
22	81	59	77	56	66	63	66	55	45	31	30	20	34	21	56	38	55	29	67	47	64	54	64	52
23	70	54	88	63	64	61	58	45	38	30	28	13	27	12	47	34	48	28	77	50	61	46	69	46
24	74	54	90	74	66	60	53	40	39	30	21	5	28	19	42	31	28	19	66	51	55	43	83	58
25	75	53	79	65	73	55	45	38	41	33	24	12	30	12	44	30	33	24	55	37	58	46	83	65
26	76	59	75	54	60	45	48	36	37	31	26	17	44	22	44	25	40	26	57	45	67	49	81	64
27	83	65	72	49	57	41	51	31	39	30	25	16	44	36	37	24	45	27	53	44	66	55	75	61
28	81	69	76	53	58	43	60	45	38	25	22	8	45	25	43	25	42	26	52	45	72	54	80	61
29	76	64	78	61	57	47	50	46	37	22	27	17	51	35	.....	.....	42	23	52	43	79	56	84	64
30	75	62	79	64	52	41	64	47	30	16	30	16	45	34	.....	.....	51	30	44	38	80	65	87	70
31	80	60	85	70	.....	.....	73	59	.....	.....	25	16	54	38	.....	.....	60	37	.....	.....	82	62	.....	.....
Range	40°		42°		35°		49°		56°		51°		56°		39°		56°		52°		54°		41°	
Monthly means	75°.4		73°.2		60°.8		48°.8		41°.3		23°.1		27°.1		*37°.1		31°.0		48°.1		60°.2		70°.2	

* Mean of 27 days.

Maximum, minimum, and mean temperatures—Continued.

STATION, TORONTO, CANADA.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min	Max.	Min.
1	65	52.9	77.6	63.2	77.8	59	54.5	35.2	59.2	42.8	16.7	— 0.9	23.5	13.4	41.2	30.2	41.5	22.6	51.6	35	47.1	30.8	75.3	53.5
2	70.1	59.7	79	59.1	70.3	48	59	43.6	58.8	49.6	22.1	15.6	17.2	7.8	40.5	32.3	43.1	32.3	48.1	21.6	47.1	30	75.1	55.9
3	82.2	64.8	75.2	64.4	72.7	48.5	54.3	46	57.2	44.5	25.4	18	13.3	— 1.1	39.5	32.3	41.5	28.1	31.4	18.7	57.2	31.5	74.1	52.5
4	71.9	56.9	82.9	62.9	69.8	48.8	51.2	40.4	51.2	42.6	26.4	11.6	16.9	— 0.5	33.7	18.9	32.6	17.7	44.5	27.2	55.5	33.7	69.2	47.3
5	75.1	57.7	87.2	67.1	67	45	53.7	40.6	46.9	31.3	30.6	17.6	21.8	7.2	31.4	17.9	31.2	8.5	42.5	32.7	51.1	29.7	62	44
6	78.4	55.5	84.9	68.2	66.8	43.2	58	45	45.2	38.2	34	23.6	32.2	16.6	36	30.1	31.7	1.3	48.3	31.7	58	38.5	69.6	50.7
7	77.7	56.1	87.1	59.7	68.5	55.4	47.4	40	43.9	35.5	30.2	21.4	34	24.5	40.3	23.7	33.4	14.2	46.6	27	65.8	35.7	67	55.7
8	92.9	61.5	80.8	56.2	75.1	53.9	50.1	30.1	44.9	34.3	26	14.4	26.2	— 1.7	31.2	12.6	32.2	16.9	41.2	29.8	56	40.5	76.7	54.6
9	91.8	72.8	82.7	57.7	65.8	51.7	47.1	27.4	42.5	34.8	15.3	— 3.2	15.7	— 6.6	36.5	14.7	27.5	13	48.3	36	52.9	40.2	72.3	56.5
10	88.9	70.2	85.1	62.7	60	55.2	52	32.8	40.2	32.5	13.3	— 9.5	24	14.8	40.2	24.6	19.3	8.1	53.6	37.5	53	41	65	50.3
11	80.3	66	87	62.8	62	50.6	42.5	27.6	43.3	30.1	27.6	7.3	28.2	4	40.3	21.4	32.4	2.5	56.1	41	58	41.5	60	41.1
12	87	62.2	82.9	70.6	63.2	47.8	49.1	25.4	42.4	28.2	35	23.6	3.7	—14.8	41.1	12.2	30.6	21.1	49.5	32.7	63.6	40.5	63.8	44.5
13	85.1	68.8	85.1	68.6	62.8	48	54.2	34.4	49.1	31.2	40.1	31.5	15.5	— 6	21.6	4.9	32.2	16.8	46.6	31.5	66.5	40.5	73.3	47.3
14	86.7	61.7	88	67.8	65	50.7	46.3	25.4	45.9	30.4	36.2	20.1	18.4	7	28	6.6	35	17.7	53	34.5	69.3	40.5	72.1	56.1
15	79.8	58	81.9	61.3	69.1	51.9	41.6	23	38.2	28.5	30.2	11.8	19.2	8.2	33.2	16.8	27.2	16.9	60.4	36	68.6	41.5	75.1	55.5
16	80.3	56.5	74.9	56.9	63.2	48.8	48.4	31.8	41.1	26.6	30.2	— 2.9	17.3	4.8	40.1	21	25.2	7.8	49.1	33.5	73.6	48.7	76	55.5
17	82.7	56.7	77.5	63.4	60	51.2	46.7	27	41.9	33.1	14.5	— 6.7	22.8	— 2	21	13.9	14.3	— 0.6	58.8	39.7	70	54.5	33.9	53.7
18	84	67.8	76.5	65.1	64	52.7	47.9	23.5	45.4	39.2	16	3.4	25.6	6.2	26.7	7.8	21.4	5.9	47.1	42.4	83.9	52.5	72.3	50.7
19	83.9	61.5	84.7	62.7	64.8	54.5	51.2	30.8	44.9	41.2	16.9	3.1	35.2	22.7	25.3	7	24	2.7	43.9	39	75.6	59.5	73.9	52.5
20	86.4	61.5	70.4	53.4	67	53.3	58	39.4	43.1	39	16.5	— 2.9	40.8	12.2	33.4	13.2	29	6.7	51.9	37.5	71.6	58.3	64.8	50.7
21	74.2	53	71.3	48.8	65	56.7	61.6	45.2	42.8	39.5	17.8	10.1	17.3	4.6	43.3	25.4	40.2	26	60	37.5	71.1	54.5	71.1	52
22	68.3	51.1	74.6	47.9	64.8	58.2	58.8	45.4	44.5	34.3	25.7	15.8	25.7	12	44.9	29.5	40.1	27	66.2	43.5	63.8	48.3	65	51.3
23	70.5	55	80	64.1	63	56.1	58	45.6	36	31.1	25.7	4.3	19.4	8.2	41.1	33.7	36	21.6	67.2	39	51.6	36.5	70.3	41.7
24	71.5	51.8	78.3	64.2	62.5	57.7	49.6	37	34.8	29.2	11.8	1	17.1	8	43.6	34.3	32.6	21.6	65	39.5	53.1	35.7	77.8	49.3
25	66.2	48.3	85.1	52.9	67.6	58.2	45.5	36	36.2	28.3	25.3	2.1	18.3	3.6	37.2	27.4	40.3	28	55.4	35.7	62.2	41.7	85.9	59.7
26	67.2	46.2	75.8	48	61.3	43	43.4	33.1	35.4	20.8	25.4	17.7	31.8	15.2	32.2	28.1	39.2	34.5	57.6	33.3	67.2	48.5	68.1	57.7
27	69.2	50.4	75.5	46	51.1	52.8	43.9	32.1	34.1	17.8	21	11.2	33.6	15.6	39.6	23.5	36.9	28.7	55	42.9	68.3	52.1	74.1	57.9
28	77.1	59.5	75.9	45	58.8	41.8	39.6	31.8	35.4	25.8	26.6	12	34	8.5	40.7	22.4	30.4	22	50.3	38.5	71.9	44.7	73.6	55.7
29	74.1	56.2	79.2	51.5	57.8	40.4	39.6	31.8	33.2	22.1	23.3	12.9	39	15.4	.....	.....	36	19.4	57.6	40.5	73.9	48.7	75.3	53.7
30	78	60	80.4	64.2	55.8	38.5	38.4	27.8	24	5.4	19.2	10.5	33.2	22.1	.....	.....	45.1	27.5	48.1	39.1	73.1	47.7	78.9	61.3
31	80.7	61	83.9	63.1	.....	.....	46.1	30.6	.....	.....	23.5	14.2	34.4	27.3	.....	.....	40.1	22.6	.....	.....	78.6	51	.....	.....
Range	46°.7		43°.0		39°.3		38°.6		53°.8		49°.6		55°.6		40°.0		45°.7		48°.5		54°.2		44°.8	
Monthly means	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

Maximum, minimum, and mean temperatures—Continued.

STATION, TYBEE ISLAND, GA.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	95	75	86	70	95	76	67	50	76	60	.....	.....	56	36	68	44	60	51	72	56	67	54	78	67
2	93	77	84	73	94	76	64	45	79	63	.....	.....	46	27	72	46	63	52	74	58	72	52	81	66
3	95	78	87	76	88	75	71	48	80	63	.....	.....	42	25	69	53	62	47	65	58	78	51	84	64
4	94	75	87	77	84	70	78	54	65	54	.....	.....	40	24	59	54	75	52	61	55	79	62	85	66
5	94	77	87	77	87	72	81	60	65	58	.....	.....	49	32	54	50	68	47	73	52	75	61	86	71
6	92	75	91	76	87	75	78	64	67	58	.....	.....	59	38	55	47	50	41	72	54	79	62	92	67
7	91	73	88	75	89	77	76	67	67	54	.....	.....	53	37	56	50	61	46	70	59	74	64	82	71
8	96	74	90	74	91	75	68	55	59	39	.....	.....	54	33	61	49	74	54	71	55	73	56	87	74
9	96	73	90	75	91	74	60	54	57	40	.....	.....	46	29	59	46	65	39	68	50	72	54	88	75
10	98	77	90	76	90	72	64	58	55	39	.....	.....	50	31	52	43	46	32	51	45	69	56	89	73
11	95	78	90	76	88	70	69	61	56	42	.....	.....	52	35	61	44	55	38	58	46	72	64	77	72
12	92	79	94	75	82	70	65	51	70	44	59	44	71	44	60	49	68	52	65	54	74	63	77	72
13	97	76	90	74	86	73	64	52	70	53	63	37	72	52	53	48	76	57	73	52	68	63	79	74
14	94	75	88	73	87	72	72	60	73	46	60	46	74	55	48	37	68	56	61	43	76	65	83	75
15	100	77	89	72	87	72	72	56	75	53	56	45	67	52	46	37	61	51	63	51	75	66	84	74
16	99	79	88	73	78	71	59	49	65	51	61	37	69	55	52	44	69	45	73	49	76	63	84	73
17	88	75	92	75	79	66	66	54	62	54	52	44	65	51	54	39	71	49	76	52	75	65	85	72
18	88	79	94	76	85	67	67	56	60	54	63	40	62	51	57	36	59	40	77	59	74	67	88	72
19	87	76	96	78	85	69	69	63	67	47	45	29	67	50	69	40	68	41	69	64	79	69	90	74
20	91	78	94	80	87	70	69	63	61	37	50	37	72	53	54	44	71	51	78	63	80	70	94	73
21	94	73	90	80	84	74	78	63	66	43	61	42	66	55	60	35	76	57	79	59	88	71	92	76
22	88	73	87	80	85	74	79	61	70	44	60	50	67	53	61	37	58	49	71	56	91	72	93	73
23	93	74	88	78	85	69	71	60	70	48	60	46	53	44	63	41	69	45	78	54	90	70	80	74
24	95	73	88	76	86	66	68	54	(*)	(*)	48	38	54	43	61	43	74	46	84	54	79	68	89	74
25	76	71	89	75	86	68	71	53	.....	.....	43	35	48	38	56	42	65	53	86	60	73	64	94	72
26	82	69	91	75	87	69	70	50	.....	.....	41	35	56	46	54	41	56	42	80	64	72	62	97	78
27	84	75	88	75	75	67	64	51	.....	.....	46	38	62	47	56	45	68	48	81	63	71	65	96	73
28	88	75	81	74	75	65	69	54	.....	.....	49	39	54	42	59	47	73	51	79	64	71	62	91	72
29	91	77	86	77	80	66	74	51	.....	.....	60	32	61	42	.....	.....	67	50	76	65	72	65	83	75
30	92	68	88	74	85	61	78	55	.....	.....	40	25	66	42	.....	.....	60	51	70	57	75	64	88	74
31	86	74	92	74	.....	.....	72	60	.....	.....	43	26	60	47	.....	.....	66	55	.....	.....	76	66	.....	.....
Range	32°		28°		34°		36°		.....		.....		50°		37°		44°		43°		40°		33°	
Monthly means	83°.1		80°.9		77°.1		62°.4		†58°.3		‡45°.1		49°.3		50°.4		56°.0		62°.3		68°.4		77°.7	

* Observer sick. † Mean of 23 days. ‡ Mean of 20 days.

Maximum, minimum, and mean temperatures—Continued.

STATION, VICKSBURG, MISS.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	92	75	88	70	94	74	66	46	79.5	58	36	22.5	36	27	73	52	63	51.5	72	62	74	46	89	67
2	92	75	92	69	94	73	69.5	42	73	51	40	21	40	25	66	59	62	47	69.5	50	78	53	89	67
3	95	77	92	68	90	71	72.5	46.5	60	40	42	24	40	22	65	55	74	45.5	55	49	76	55	89	67
4	95	75	87	71	91.5	72.5	78.5	52.5	63	46	42	21	47	24	59	48	64	43	63	51	77	62	85	67
5	94	73	88.5	72	94	74	82	62	77	52.5	45	23	47	35	59.5	40	53.5	36	78	51	78.5	61.5	87	67
6	93	73	91.5	72	93.5	73.5	86	65	69.5	51.5	50	28	45	40	62.5	40	59	32	79	64	78	60	90	68
7	91	74	91	73	93	74	72.5	55	58	43	52	42	55	34	65	44	69	46	71	56	74	58	91	74
8	92	73	87	71	93	73	69	46	55.5	38.5	56	42.5	50	20	69	46	70	41.5	72	53	69	56	92	74
9	89	75	75.5	71	91	73	70	45.5	59.5	38.5	46	29	38	16	65	48	47	32	65	54	74.5	50	83	66
10	90.5	76	83	71	92.5	74	75	48	63	37	57	35	59	27	64	42	51	29	71	49	77	57	75	57
11	97.5	74	87	74	79.5	64	66	50.5	70	45	58	44	68	47	65	44	67.5	44.5	74	49	82	57	81	58
12	95	73	88	74	79.5	58.5	68.5	39.5	75.5	51	66	42.5	73	63	63	54	70	54	65.5	50	77	61	86	64
13	87	72	90	73.5	83	60	78	49	75	56	69	45	65	42	57	45	63	55.5	67	49	85	64	88	68
14	93	75	93.5	74	82	65	77	56	65	45.5	64	49	63.5	41	49	42.5	64	54	73	50	85	65.5	85	73
15	96	73	93	73	76	58	66	43.5	46	41	52	41	68	56	46	41	64	44	78	54	84	65	89	73
16	92	72	94	72	75	55	67.5	35	53.5	42	55	33	58	36.5	50	42.5	77.5	44	77	56.5	85	64	89	74
17	95	77	95.5	73.5	79	55	74	47.5	57	48.5	66	37	46	35	59	39.5	69.5	42.5	71	61	86	64	92	75
18	96.5	79	95.5	76	85	61	74	57.5	56.5	48	56	26	58	43	64	39	65.5	37	77	66	87	65	89	73
19	97	71	95.5	76.5	85	62	80.5	59	60	39	44	18	62	49	63	49	73	48	74	60	86	70	86	74
20	94	73	97	77	87.5	70	82	67	60	32	52	28	63	48	54.5	38	73	55	72	58	86.5	67.5	90	73
21	96.5	75	97.5	78	83	66	85	69	66	43.5	56	44	51	37	56	34	67	54	78	54	91	70	92	76
22	95.5	75	95	75	87	66.5	74	54.5	58.5	39	60.5	48	46	36	50	42	72	46	81	57	93	69	89	74
23	97	77	93.5	73.5	91	61	69.5	49	50	39.5	50	37	40.5	34	58.5	41	78	53	71	60	95	72	92	74
24	96.5	76	91.5	75	90	67.5	75	51	49.5	39.5	43	34.5	49	30	59	40	67	42	69	61	82	66	93	76
25	87	71	94.5	74	91	70.5	73	52	57	35	37	30	45	30	58	35	54.5	34	70	62	78	62	92	75
26	86	73	91	73	90.5	70	78.5	56	66	39	35	27	51	39	55	36	68	39	80	63	81	61	93	70
27	92.5	73	92	73	74	59	77	58.5	66.5	51	40	23	59	35	59	31	79	55	73	63	85	59	90	68
28	96	75	95	73.5	78.5	51.5	78.5	61	60	43	38	33	63	36	68	45	76	55	71	58	86	61	95	74
29	97	74	95.5	74.5	76	53	78	59	56.5	45.5	40	24	66	41	.....	.....	69	49	67	49	83	64	94	74
30	97	78.5	96.5	75.5	68	54	79	57	46	32	32	13.5	67	48	.....	.....	79	55	68	49	86	64	92	77
31	90	71	95	75.5	.....	.....	78.5	57	.....	.....	32	24	66	49	.....	.....	75	55	.....	.....	88	64	.....	.....
Range	26°.5		29°.5		42°.5		51°		47°.5		55°.5		57°		42°		50°		32°		49°		38°	
Monthly means	82°.6		80°.2		74°.0		63°.2		52°.3		41°.2		45°.6		51°.8		57°.2		64°.1		72°.9		79°.4	

Maximum, minimum, and mean temperatures—Continued.

STATION, VIRGINIA CITY, MONT.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	86	44	84	43	77	40	71	38	31	18	40	15	38	24	37	20	33	14	43	15	46	30	52	33
2	84	54	83	54	78	50	68	42	33	17	43	19	26	12	36	20	28	— 3	41	28	52	31	62	36
3	81	48	84	51	76	47	67	34	31	22	43	21	32	11	36	25	13	— 9	47	25	58	31	59	42
4	79	49	79	49	70	48	67	44	38	16	47	21	43	23	28	12	27	1	56	30	50	37	68	39
5	82	49	77	43	59	38	69	42	34	22	47	24	46	37	35	13	39	11	60	34	46	31	51	40
6	84	57	86	50	61	43	59	38	40	23	39	19	43	35	39	19	40	31	54	36	56	28	56	32
7	61	53	92	56	61	37	57	40	51	28	39	18	36	9	36	20	36	26	43	28	44	34	52	38
8	62	45	87	61	64	39	62	35	52	29	41	16	40	17	40	17	31	— 7	39	27	45	31	62	33
9	78	43	71	31	73	43	66	40	56	32	45	28	46	36	42	21	29	— 3	43	35	40	30	70	39
10	71	50	60	37	73	44	61	40	52	31	47	20	44	19	34	7	45	23	42	27	48	26	68	40
11	62	39	67	50	57	35	62	41	41	21	49	24	20	— 2	21	— 5	40	28	45	24	58	32	73	45
12	72	41	53	41	55	36	55	42	23	12	43	18	4	—12	38	13	46	26	52	25	63	35	71	48
13	70	49	57	38	63	38	56	40	33	10	30	8	23	— 1	39	19	48	38	46	30	64	37	73	38
14	74	48	63	43	73	39	58	38	47	22	31	9	27	— 3	35	23	57	43	55	23	56	38	60	25
15	74	48	64	45	68	42	63	39	47	32	35	16	12	—12	27	9	52	34	58	35	57	40	75	37
16	75	44	70	42	63	38	62	36	43	26	43	16	26	11	34	10	46	32	45	31	64	36	80	46
17	79	46	70	43	63	38	51	35	41	24	24	7	16	— 4	40	18	55	36	48	30	56	30	72	50
18	88	50	79	45	70	36	45	31	51	22	37	11	4	— 9	40	16	51	38	55	26	39	30	69	47
19	81	46	85	53	60	36	42	30	44	30	30	14	24	0	41	16	39	31	58	32	48	34	66	49
20	85	51	79	58	75	45	58	25	34	19	29	12	18	— 2	43	25	47	28	38	20	51	36	74	44
21	83	56	76	47	72	45	41	24	28	18	29	22	13	— 3	41	22	54	30	30	19	55	35	79	44
22	82	58	69	50	60	31	53	38	30	9	27	1	7	—16	47	25	43	29	25	16	56	38	69	45
23	76	60	69	32	65	43	49	35	42	22	5	—18	15	— 5	49	28	44	21	32	8	58	35	49	32
24	72	60	63	33	64	40	56	34	46	31	18	0	21	1	35	17	54	27	43	11	62	35	56	39
25	68	54	77	38	70	44	63	35	48	41	27	11	26	3	36	20	57	38	44	22	69	41	53	31
26	72	51	73	42	75	43	59	36	43	29	27	14	29	10	34	26	57	39	48	29	77	42	52	38
27	81	50	78	43	69	46	60	36	30	19	19	7	35	14	38	26	53	32	48	32	74	44	61	35
28	82	52	66	44	64	43	54	31	24	13	15	2	32	15	36	22	55	37	51	33	66	43	71	38
29	88	57	68	42	63	39	34	20	21	1	36	12	34	15	.....	.....	52	35	59	30	53	41	53	41
30	89	50	78	44	65	41	34	24	36	11	32	14	38	21	.....	.....	39	27	54	33	42	37	60	35
31	78	52	66	41	.....	.....	34	24	.....	.....	33	19	41	26	.....	.....	29	19	.....	.....	46	33	.....	.....
Range	50°		61°		47°		51°		55°		67°		62°		54°		66°		52°		51°		49°	
Monthly means	64°.5		58°.5		53°.5		44°.9		30°.9		24°.4		18°.8		27°.5		33°.2		36°.5		44°.0		52°.8	

Maximum, minimum, and mean temperatures—Continued.

STATION, WASHINGTON, D. C.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	91	69.5	72	66.5	89	71.5	58.5	45	76	46	26	18	20	14.5	67	40	54	28.5	67	43	51	40	87.5	59
2	94.5	76	72	65	78	63	61	44	76	54	31	20	25	12	56	44	51.5	39	60	40	51	39.5	90	64
3	91	76.5	75.5	66	76	55.5	64.5	40	68	47	34	27	18	— 3	55	37	56	43	50	31.5	56	40	91	68
4	96	74	81.5	68.5	83.5	53.5	65.5	50	54.5	40	36	23	19.5	— 3	50	39	56.5	35	45	38	66	42	81.5	68
5	94	73	87	72	71	56	61.5	48.5	57.5	40	35	22	22.5	— 3	43	35	38.5	31.5	48	39	62	45.5	82	65
6	89	72	92	71.5	72.5	50	68	49.5	55.5	35.5	41	21	37	13.5	50	36	43	26	62	39	57	46	82	64
7	92	73	96	73	78.5	62	61	45	54.5	41	48	27	46	31.5	58	28	56	34.5	63	38	65	40.5	75.5	63
8	85	76	87.5	72	87.5	66	61.5	39	53	37	43	33	40	21	37	32.5	67.5	41.5	48	38	51	46.5	89	61
9	97	80	86	70	77.5	66	58.5	37	52.5	38	35	4	21	10	47	27	61	26	47	38.5	52.5	46	86	69.5
10	97	80	84.5	68.5	67.5	62	68	43	50	37	22	3.5	25	10	48	24	34.5	19	58	39	62	42.5	76.5	61.5
11	98.5	77	82.5	73	65	61	57	40	47	36	33	22	39	13.5	58.5	27	44	20.5	65	39.5	62	43	73.5	58.5
12	98	76.5	83.5	72	65	60	55.5	32	54.5	33	44	24.5	37	30.5	65.5	32	57.5	35.5	64	39	65.5	48	73	59
13	93	75	84	68.5	70	57	65	32	69	36	58	29.5	40	30	37	22	50	43	45.5	37	65	44.5	82.5	65
14	91	73	84.5	70	78	59	71	42	69.5	49	60	38	37.5	24	42	20	45	39.5	55	37	76.5	50.5	86.5	69
15	87	75	91.5	68	74.5	61	49	34	52	45	47	23	35.5	29.5	48	23	42	27.5	64.5	32	83.5	52	85	69.5
16	88	70	93	73.5	65	59	53	29.5	46.5	41.5	41	12	54	35	53.5	34	47.5	29	71	42	89	63.5	78.5	72
17	91	70	90.5	74.5	72.5	58.5	64	36	45	41	20	10	40	31	47.5	29	38	23	66	52	91.5	62.5	86	69
18	93	74	76.5	73	76.5	59.5	62.7	33.5	53	44	36	16	36	29.5	47	25.5	33	13	62	53	95.5	64.5	87	69.5
19	95	77.5	83	72	73	59.5	64.5	33	52	48	29	10	38	34.5	40	32	27	21	63	49.5	93	69	92.5	70.5
20	98.5	80.5	84	69	75	57	62	49.5	52	46	26	10.5	61	35.5	39.5	22	41	16	68	49.5	93.5	68.5	85	70.5
21	87	73	76	54.5	72	61.5	70.5	57	52	46	30	14	42	30	61.5	29	51	32.5	59	42.5	90.5	67	89	67.5
22	90	67.5	82	53	64	60.5	65.5	58.5	56	46	32	18	32	27	63	28	50	38	72	45.5	90	65.5	73	62.5
23	83	67	80	64.5	71.5	62	72	57.5	46	37	32	23	35	21.5	47.5	37	70	39.5	76.5	47	73	57	76	52
24	74	59.5	86	67.5	65.5	62	65	49.5	40	32	26	20	32.5	21.5	41.5	34.5	70.5	39.5	82.5	48.5	57	47	79	59
25	82	58.5	86	72	73	61	56	44	42	30	25	19	34	17.5	47	37	61	44	70.5	57.5	63.5	42.5	89	66
26	80	66	82	68	69	52	50	42	42	33	34	23	43	14	38	34	54	42.5	62.5	48	70	49.5	96	69.5
27	85	59.5	77	59	60.5	48	53	39	37	30	33	19	54	23	44	33	49.5	40	53	48.5	72.5	52	98	69
28	87.5	68	81	56	66	46	62	35	46	34	27	18	43	29.3	49	30	47.5	32	56.5	50	79.5	48.5	70	68
29	86	68	88	57	73.5	51	49	43.5	43	30	33	22	55	29	.....	.....	49	33	65.5	54	79	54	81	60.5
30	75	65	88	69	60	49	53	45	34	25	32.5	22	52	28	.....	.....	56	33.5	69	49.5	82	53	87.5	64.5
31	70.5	63	88	68.5	.....	.....	58	49	.....	.....	25	17.5	53	28.5	.....	.....	50	32	.....	.....	85	56	.....	.....
Range	40°		43°		43°		48°.5		51°		56°.5		64°		47°		57°.5		51°		56°		44°	
Monthly means	80°.3		75°.3		65°.3		51°.4		45°.6		30°.0		30°.0		39°.7		41°.3		53°.0		62°.1		73°.7	

Maximum, minimum, and mean temperatures—Continued.

STATION, WILMINGTON, N. C.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	85	75	82	70	94	75	66	53	81	57	37	28	40	28	71	45	56	38	71	50	64	49	80	58
2	88	75	84	71	88	74	63	44	76	57	35	18	39	24	71	48	68	54	66	58	61	42	83	58
3	87	76	87	75	82	64	68	45	78	65	41	22	37	17	67	54	65	46	59	51	65	43	90	64
4	89	76	88	74	82	62	76	54	65	52	42	21	35	19	57	45	75	53	56	44	77	61	93	69
5	89	75	90	72	88	66	77	59	63	43	37	25	46	21	48	43	59	39	67	46	75	61	82	68
6	94	75	87	74	82	68	80	68	69	42	50	23	62	38	64	41	52	34	76	49	73	56	90	72
7	95	71	87	74	90	71	72	61	65	52	59	34	58	42	61	41	64	34	61	53	63	52	88	64
8	92	73	93	72	94	73	61	51	56	46	46	41	56	36	58	45	65	53	60	51	63	53	89	70
9	95	75	90	70	95	74	57	48	57	39	44	28	56	30	53	37	69	40	59	43	63	50	86	70
10	97	78	90	71	80	70	61	56	55	39	36	15	44	28	53	31	47	28	47	39	67	45	84	74
11	93	79	81	68	87	72	67	50	55	35	64	28	55	27	63	36	51	29	64	36	72	50	86	66
12	94	75	85	69	80	69	55	46	68	42	58	43	74	42	68	36	64	35	68	44	65	56	78	65
13	93	75	85	72	81	68	65	50	73	47	65	36	73	53	48	36	71	57	61	47	69	59	76	67
14	92	76	85	72	82	65	71	54	74	49	62	49	69	46	43	28	64	49	58	44	67	59	81	71
15	94	78	87	71	79	69	61	42	76	54	53	37	64	45	53	32	55	42	64	38	74	56	82	72
16	91	75	91	73	70	66	58	32	63	47	56	32	73	59	54	45	63	38	68	47	77	58	86	72
17	87	72	90	75	77	67	70	39	52	46	46	28	60	51	52	37	70	38	74	58	77	59	88	72
18	88	69	97	76	84	66	71	44	64	45	66	32	51	44	57	31	50	30	73	60	79	56	90	73
19	90	74	97	78	83	63	73	48	66	47	46	19	53	46	66	41	64	37	69	62	89	61	94	72
20	93	76	93	77	86	65	68	65	57	37	50	22	70	50	53	36	70	53	74	63	86	67	92	72
21	86	71	86	73	83	69	76	63	66	43	59	34	74	49	62	30	68	50	70	55	85	71	89	75
22	82	70	82	66	76	68	78	55	69	45	61	46	49	40	63	38	57	45	75	50	89	66	92	74
23	94	71	89	67	83	70	78	61	68	45	58	43	42	36	65	48	71	43	78	52	82	68	78	67
24	84	69	79	70	85	65	71	53	52	38	43	31	49	32	61	43	78	52	85	52	74	61	84	65
25	69	63	85	72	78	64	68	51	45	36	33	23	48	26	57	39	69	55	79	60	67	52	93	70
26	81	64	85	75	85	65	68	41	52	32	34	30	56	30	57	34	64	48	80	61	71	48	97	74
27	83	65	84	74	69	57	59	39	62	35	41	32	63	44	56	36	63	45	79	61	74	51	97	71
28	87	74	83	67	72	50	69	38	57	40	41	32	56	38	60	34	67	45	76	64	74	54	86	70
29	88	74	85	63	73	58	79	50	43	40	56	31	66	33	....	....	62	44	77	66	75	52	84	67
30	85	70	87	68	79	62	72	54	43	36	39	24	66	42	....	....	66	42	72	57	78	54	89	67
31	80	70	94	72	.....	.....	79	51	.....	.....	40	22	66	39	....	....	65	42	.....	.....	78	57	.....	.....
Range	34°		34°		45°		48°		49°		51°		57°		43°		50°		49°		47°		39°	
Monthly means	79°.8		78°.3		73°.7		59°.6		53°.0		39°.1		46°.1		48°.1		53°.4		60°.1		64°.5		76°.5	

Maximum, minimum, and mean temperatures—Continued.

STATION, WASHINGTON, D. C.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	91	69.5	72	66.5	89	71.5	58.5	45	76	46	26	18	20	14.5	67	40	54	28.5	67	43	51	40	87.5	59
2	94.5	76	72	65	78	63	61	44	76	54	31	20	25	12	56	44	51.5	39	60	40	51	39.5	90	64
3	91	76.5	75.5	66	76	55.5	64.5	40	68	47	34	27	18	— 3	55	37	56	43	50	31.5	56	40	91	68
4	96	74	81.5	68.5	83.5	53.5	65.5	50	54.5	40	36	23	19.5	— 3	50	32	56.5	35	45	38	66	42	81.5	68
5	94	73	87	72	71	56	61.5	48.5	57.5	40	35	22	22.5	— 3	43	35	38.5	31.5	48	39	62	45.5	82	65
6	89	72	92	71.5	72.5	50	68	49.5	55.5	35.5	41	21	37	13.5	50	36	43	26	62	39	57	46	82	64
7	92	73	96	73	78.5	62	61	45	54.5	41	48	27	46	31.5	58	28	56	34.5	63	38	65	40.5	75.5	63
8	85	76	87.5	72	87.5	66	61.5	39	53	37	43	33	40	21	37	32.5	67.5	41.5	48	38	51	46.5	89	61
9	97	80	86	70	77.5	66	58.5	37	52.5	38	35	4	21	10	47	27	61	26	47	38.5	52.5	46	86	69.5
10	97	80	84.5	68.5	67.5	62	68	43	50	37	22	3.5	25	10	48	24	34.5	19	58	39	62	42.5	76.5	61.5
11	98.5	77	82.5	73	65	61	57	40	47	36	33	22	39	13.5	58.5	27	44	20.5	65	39.5	62	43	73.5	58.5
12	98	76.5	83.5	72	65	60	55.5	32	54.5	33	44	24.5	37	30.5	65.5	32	57.5	35.5	64	39	65.5	48	73	59
13	93	75	84	68.5	70	57	65	32	69	36	58	29.5	40	30	37	22	50	43	45.5	37	65	44.5	82.5	65
14	91	73	84.5	70	78	59	71	42	69.5	49	60	38	37.5	24	42	20	45	39.5	55	37	76.5	50.5	86.5	69
15	87	75	91.5	68	74.5	61	49	34	52	45	47	23	35.5	29.5	48	23	42	27.5	64.5	32	83.5	52	85	69.5
16	88	70	93	73.5	65	59	53	29.5	46.5	41.5	41	12	54	35	53.5	34	47.5	29	71	42	89	63.5	78.5	72
17	91	70	90.5	74.5	72.5	58.5	64	36	45	41	20	10	40	31	47.5	29	38	23	66	52	91.5	62.5	86	69
18	93	74	76.5	73	76.5	59.5	62.7	33.5	53	44	36	16	36	29.5	47	25.5	33	13	62	53	95.5	64.5	87	69.5
19	95	77.5	83	72	73	59.5	64.5	33	52	48	29	10	38	34.5	40	32	27	21	63	49.5	93	69	92.5	70.5
20	98.5	80.5	84	69	75	57	62	49.5	52	46	26	10.5	61	35.5	39.5	22	41	16	68	49.5	93.5	68.5	85	70.5
21	87	73	76	54.5	72	61.5	70.5	57	52	46	30	14	42	30	61.5	29	51	32.5	59	42.5	90.5	67	89	67.5
22	90	67.5	82	53	64	60.5	65.5	58.5	56	46	32	18	32	27	63	28	50	38	72	45.5	90	65.5	73	62.5
23	83	67	80	64.5	71.5	62	72	57.5	46	37	32	23	35	21.5	47.5	37	70	39.5	76.5	47	73	57	76	52
24	74	59.5	86	67.5	65.5	62	65	49.5	40	32	26	20	32.5	21.5	41.5	34.5	70.5	39.5	82.5	48.5	57	47	79	59
25	82	58.5	86	72	73	61	56	44	42	30	25	19	34	17.5	47	37	61	44	70.5	57.5	63.5	42.5	89	66
26	80	66	82	68	69	52	50	42	42	33	34	23	43	14	38	34	54	42.5	62.5	48	70	49.5	96	69.5
27	85	59.5	77	59	60.5	48	53	39	37	30	33	19	54	23	44	33	49.5	40	53	48.5	72.5	52	98	69
28	87.5	68	81	56	66	46	62	35	46	34	27	18	43	29.3	49	30	47.5	32	56.5	50	79.5	48.5	70	62
29	86	68	88	57	73.5	51	49	43.5	43	30	33	22	55	29	.....	.....	49	33	65.5	54	79	54	81	60.5
30	75	65	88	69	60	49	53	45	34	25	32.5	24	52	28	.....	.....	56	33.5	69	49.5	82	53	87.5	64.5
31	70.5	63	88	68.5	.....	.....	58	49	.....	.....	25	17.5	53	28.5	.....	.....	50	32	.....	.....	85	56	.....	.....
Range	40°		43°		43°		48°.5		51°		56°.5		64°		47°		57°.5		51°		56°		44°	
Monthly means	80°.3		75°.3		65°.3		51°.4		45°.6		30°.0		30°.0		39°.7		41°.3		53°.0		62°.1		73°.7	

Maximum, minimum, and mean temperatures—Continued.

STATION, WILMINGTON, N. C.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	85	75	82	70	94	75	66	53	81	57	37	28	40	28	71	45	56	38	71	50	64	49	80	58
2	88	75	84	71	88	74	63	44	76	57	35	18	39	24	71	48	68	54	66	58	61	42	83	58
3	87	76	87	75	82	64	68	45	78	65	41	22	37	17	67	54	65	46	59	51	65	43	90	64
4	89	76	88	74	82	62	76	54	65	52	42	21	35	19	57	45	75	53	56	44	77	61	93	69
5	89	75	90	72	88	66	77	59	63	43	37	25	46	21	48	43	59	39	67	46	75	61	82	68
6	94	75	87	74	82	68	80	68	69	42	50	23	62	38	64	41	52	34	76	49	73	56	90	72
7	95	71	87	74	90	71	72	61	65	52	59	34	58	42	61	41	64	34	61	53	63	52	88	64
8	92	73	93	72	94	73	61	51	56	46	46	41	56	36	58	45	65	53	60	51	63	53	89	70
9	95	75	90	70	95	74	57	48	57	39	44	28	56	30	53	37	69	40	59	43	63	50	86	70
10	97	78	90	71	80	70	61	56	55	39	36	15	44	28	53	31	47	28	47	39	67	45	84	74
11	93	79	81	68	87	72	67	50	55	35	64	28	55	27	63	36	51	29	64	36	72	50	86	66
12	94	75	85	69	80	69	55	46	68	42	58	43	74	42	68	36	64	35	68	44	65	56	78	65
13	93	75	85	72	81	68	65	50	73	47	65	36	73	53	48	36	71	57	61	47	69	59	76	67
14	92	76	83	72	82	65	71	54	74	49	62	49	69	46	43	28	64	49	58	44	67	59	81	71
15	94	78	87	71	79	69	61	42	76	54	53	37	64	45	53	32	55	42	64	38	74	56	82	72
16	91	75	91	73	70	66	58	32	63	47	56	32	73	59	54	45	63	38	68	47	77	58	86	72
17	87	72	90	75	77	67	70	39	52	46	46	28	60	51	52	37	70	38	74	58	77	59	88	72
18	88	69	97	76	84	66	71	44	64	45	66	32	51	44	57	31	50	30	73	60	79	56	20	73
19	90	74	97	78	83	63	73	48	66	47	46	19	53	46	66	41	64	37	69	62	89	61	94	72
20	93	76	93	77	86	65	68	65	57	37	50	22	70	50	53	36	70	53	74	63	86	67	92	72
21	86	71	86	73	83	69	76	63	66	43	59	34	74	49	62	30	68	50	70	55	85	71	89	75
22	82	70	82	66	76	68	78	55	69	45	61	46	49	40	63	38	57	45	75	50	89	66	92	74
23	94	71	89	67	83	70	78	61	68	45	58	43	42	36	65	48	71	43	78	52	82	68	78	67
24	84	69	79	70	85	65	71	53	52	38	43	31	49	32	61	43	78	52	85	52	74	61	84	65
25	69	63	85	72	78	64	68	51	45	36	33	23	48	26	57	29	69	55	79	60	67	52	93	70
26	81	64	85	75	85	65	68	41	52	32	34	30	56	30	57	34	64	48	80	61	71	48	97	74
27	83	65	84	74	69	57	59	39	62	35	41	32	63	44	56	36	63	45	79	61	74	51	97	71
28	87	74	83	67	72	50	69	38	57	40	41	32	56	38	60	34	67	45	76	64	74	54	86	70
29	88	74	85	63	73	58	79	50	43	40	56	31	66	33	....	.....	62	44	77	66	75	52	84	67
30	85	70	87	68	79	62	72	54	42	36	39	24	66	42	....	.....	66	42	72	57	78	54	89	67
31	80	70	94	72	.....	.....	79	51	.....	.....	40	22	66	39	.....	.....	65	42	.....	.....	78	57	.....	.....
Range	34°		34°		45°		48°		49°		51°		57°		43°		50°		49°		47°		39°	
Monthly means	79°.8		78°.3		73°.7		59°.6		53°.0		39°.1		46°.1		46°.1		53°.4		60°.1		64°.5		76°.5	

Maximum, minimum, and mean temperatures—Continued.

STATION, WOOD'S HOLL, MASS.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	83	67	74	60.5	75	65	60	49.7	60	48.2	28	13.7	32	22	46	34.7	46	30.2	43	37.7	54	45.2	73	57
2	75	67.7	75	60.7	78	64	61	52	66	51	26	7.7	32	19	46	33.7	46	31.7	50	38.7	48	42	74	57
3	78	68.5	74	58.5	74	59.7	64	49	62	48	42	22.7	26	13.2	46	32.7	48	37	44	38.5	54	37	72	57
4	78	66.7	76	59.7	74	62.2	66	58	59	44.2	41	26.7	21	8	42	32	45	29	44	34.5	58	44.7	72	59
5	81	69.2	75	64	70	57	68	50	54	39.7	42	27.7	23	11	42	30.7	36	26	40	34	60	41.5	71	59
6	85	70	80	67.7	70	54.7	66	48.5	52	38.5	43	27.2	34	15.7	42	30.2	37	25.2	46	33.2	51	42	67	59
7	82	65.7	79	68.7	71	55.7	64	49	58	45	45	35.7	45	31.7	42	30.7	45	26	54	37.7	63	40.2	66	60
8	84	66.7	85	69.7	66	57.7	57	44	59	49	41	32.7	45	32.7	40	29	48	29	49	31.7	60	42	67	58.5
9	90	63	80	66	69	54	54	40.5	56	47.5	38	15	39	16	38	22	51	31	53	37	48	39.5	68	56
10	74	62.7	81	65.5	70	53	59	46	52	45	21	8.7	33	11.7	38	21	37	25.2	49	36.2	45	40	66	61
11	80	69	79	63.5	69	57.7	58	41	49	42	28	8	36	22.2	49	27	38	21	52	36.7	54	41	64	57
12	80	70	81	65.5	72	53.7	58	37.5	48	41.7	38	26.7	37	21	44	30	42	32.5	46	36.7	58	43	66	55
13	87	69.5	80	67	71	56.2	58	45	53	41.2	47	27.5	39	17	35	18.2	41	33	54	32.7	67	42.7	66	59
14	86	70.5	79	68.7	72	58.7	60	45	51	40.5	51	27.7	30	20.7	36	16.7	36	31	49	35	67	46.5	66	57
15	86	68	81	71	72	60.7	58	34	47	40	48	29	36	14.5	44	27.7	38	25	58	34.7	65	51.7	72	61
16	86	64.2	79	65	66	52	50	34.5	48	37.7	45	8	36	27	41	34.5	37	23.5	59	37.5	70	50.7	66	61
17	80	68.7	70	63	66	50.7	54	41	49	37.7	16	0.7	29	16.5	41	25	35	29.7	49	40.7	78	51.5	77	62
18	79	70.2	73	62	75	62	55	38.5	48	37.5	47	12.7	36	21	35	16.7	30	18	47	38.2	69	53.2	77	59
19	86	70.2	74	63.2	70	60	57	39	45	40.7	32	13.7	40	29.2	38	18	26	12.2	47	41.7	78	54	71	62
20	80	69.2	78	60	64	55	62	50.7	51	43.7	23	14.2	43	31.2	34	15	36	19	58	44	72	53	69	58
21	86	67	69	55.2	58	52.5	60	51.7	51	45	28	11.5	38	24	43	27	46	29	57	41.2	60	51	68	57
22	80	62.7	75	59.2	66	51.7	64	53.7	48	41.7	34	17.7	34	24	51	31.2	48	39.7	47	40.2	58	50	74	59
23	71	63.7	74	59.2	65	51	59	53.2	49	37.7	36	20	32	21	46	29	50	39	65	41	67	48.5	66	53
24	76	59.7	73	55.7	65	57.2	66	52	44	35	26	17.7	33	14	37	34	50	35.5	68	42	52	43	67	55
25	76	64.2	79	66	65	53.7	59	47	41	31.7	26	12.5	23	10.2	36	32.7	46	31.2	65	40	56	45.7	72	60
26	75	58.7	79	67	66	52.5	55	45	43	30.7	37	24.2	36	17	43	34.7	52	37	63	45.5	61	46.7	73	59
27	73	57.7	74	62.7	61	51.7	51	39.7	44	32.7	37	24	44	31	45	32	52	41.5	65	43.5	61	50	65	56
28	74	65.2	75	58.2	63	52	47	36	44	33.7	30	17.7	34	24.2	42	28.7	46	39	55	44.2	62	48	68	53
29	80	67.7	77	56.7	66	56.7	48	31.5	41	34	41	22.2	37	24.7	.....	.....	45	35	51	44.7	65	52	67	56
30	72	63.7	79	62.7	68	57.2	54	36	37	23	44	26	39	26	.....	.....	41	30.7	57	43.7	65	53	66	57
31	71	62	79	62.2	.....	.....	56	45	.....	.....	30	22.7	48	30.5	.....	.....	51	32.5	.....	.....	70	54	.....	.....
Range	32°.2		29°.7		27°.2		36°.5		43°		50°.2		40°		36°		39°.7		36°.3		41°		24°	
Monthly means	71°.9		69°.5		61°.9		51°.7		44°.8		28°.0		25°.1		33°.7		36°.6		44°.6		52°.9		63°.8	

Maximum, minimum, and mean temperatures—Continued.

STATION, YANKTON, DAK.

Day of month.	1876.												1877.									
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	66	58	74	68	69	49	60	37	46	30	8	−14	8	— 8	50	32	39	29	39	17	62	31	65	46
2	82	51	86	66	78	51	75	40	36	34	22	— 8	13	−17	48	27	30	16	34	14	53	43	72	48
3	81	58	87	67	82	64	49	35	52	25	19	0	27	13	53	26	17	0	48	29	59	37	73	47
4	79	54	89	67	74	61	47	34	52	24	31	−11	32	15	41	30	23	14	42	32	62	37	76	50
5	80	55	81	66	74	61	70	33	55	27	29	19	31	25	47	27	31	6	62	32	57	43	72	56
6	93	66	83	52	67	61	52	34	32	19	38	20	38	17	46	28	31	18	63	34	47	41	73	57
7	92	75	89	61	77	62	58	33	45	14	33	11	17	— 5	46	22	18	0	61	40	60	41	71	54
8	88	68	93	69	65	56	62	27	56	25	11	−11	16	— 3	36	19	9	−14	50	34	66	37	59	43
9	82	65	91	70	61	52	77	39	62	28	22	−12	26	10	53	21	16	— 3	54	30	68	52	65	38
10	86	61	77	52	60	48	50	25	76	29	37	21	18	— 1	59	31	33	— 5	54	36	61	52	69	46
11	93	67	79	46	62	42	53	21	56	30	46	26	18	−18	43	15	34	24	58	41	56	52	64	49
12	92	68	90	67	58	52	66	35	32	19	54	30	— 4	−18	27	5	35	20	61	32	54	50	62	45
13	79	64	87	65	62	49	51	33	19	7	43	32	28	−10	37	15	55	20	64	35	63	51	70	49
14	72	62	73	54	67	46	39	23	29	1	33	2	18	— 5	41	23	29	10	68	41	74	57	62	55
15	79	61	73	60	71	41	53	16	51	17	46	— 3	8	−18	48	27	41	27	68	43	79	60	66	57
16	90	68	87	66	75	54	71	38	36	23	8	— 6	8	−19	49	16	27	11	75	45	79	55	81	52
17	86	70	83	67	77	57	70	32	34	20	8	— 9	17	— 6	56	19	43	11	59	48	73	59	87	61
18	90	68	83	66	72	57	59	45	23	13	37	— 9	2	−12	51	30	42	20	64	45	73	62	79	62
19	92	71	82	58	64	57	62	46	36	15	20	0	27	— 7	40	26	41	21	63	44	74	57	81	54
20	89	57	81	62	68	49	54	50	31	18	18	11	26	2	58	23	35	30	68	33	66	50	84	64
21	89	58	84	69	72	40	50	43	23	6	38	11	26	10	52	37	52	26	73	45	69	49	79	53
22	77	63	92	72	73	55	55	34	26	— 1	19	3	13	— 5	38	30	34	16	78	40	61	48	81	65
23	69	59	84	63	73	44	59	36	33	— 2	6	0	25	— 5	34	20	24	9	50	34	59	53	80	62
24	76	52	74	56	74	50	49	36	39	28	13	— 1	27	— 1	34	18	35	10	54	30	69	48	74	55
25	76	53	73	49	72	41	52	28	35	22	17	7	27	9	34	17	59	27	58	42	70	45	75	61
26	86	64	78	47	65	40	56	28	37	26	8	— 8	40	7	32	26	52	28	50	42	62	56	74	53
27	84	57	78	60	82	43	64	42	31	23	9	−18	42	19	40	22	34	26	46	34	72	54	79	59
28	87	64	85	64	56	38	65	34	30	14	9	— 5	47	29	43	27	47	31	46	30	78	56	83	62
29	86	64	86	68	47	32	60	36	29	0	— 1	−14	43	21	.....	.....	40	36	49	31	81	62	84	67
30	88	67	88	70	43	26	62	41	4	— 7	12	−18	48	27	.....	.....	48	37	56	28	81	66	79	58
31	86	67	76	59	.....	.....	60	34	.....	.....	12	— 4	51	31	.....	.....	67	39	.....	.....	74	58	.....	.....
Range	42°		47°		56°		61°		83°		72°		70°		54°		81°		64°		50°		49°	
Monthly means	73°.3		73°.0		58°.1		45°.4		27°.1		12°.2		13°.6		36°.4		28°.5		45°.8		58°.8		65°.0	

Maximum, minimum, and mean temperatures—Continued.

STATION, YORK FACTORY, H. B. T.

Day of month.	1876.												1877.											
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	62	41	78	62	59	43	42	28	28	24	—12	—29	*	*	*	*	— 2	—14	4	—22	20	8.5	39	31
2	72	52	80	61	55	41	38	32	28	1	13	—16	.....	.....	.....	.....	— 6	—29	— 7.5	—22	38.5	8.5	49	27.5
3	65	40	80	61	58	38.5	34	23	6	— 6	*	*	.....	.....	.....	.....	—18.5	—39	4.5	— 8	46.5	26	65	27
4	64	40	67	49	64.5	40.5	25	20	10	—10	.....	.....	.....	.....	.....	.....	—13	—35	20.5	—12	53.5	38	67	35
5	72	42	56	42	46	39	30	18.5	8.5	— 7	.....	.....	.....	.....	.....	.....	— 8	—34	— 5	—18	42	35	37.5	31
6	65	54	67	52.5	52	38	26	17	18	0	.....	.....	.....	.....	.....	.....	—14.5	—28	— 2	—14	43.5	31	35	30
7	65.5	48.5	78	52	46.5	40.5	23	16	32	17	.....	.....	.....	.....	.....	.....	—17	—30	12	—13.5	56	39	39.5	26
8	55.5	40	84	65	50	39	26	17	35	16.5	.....	.....	.....	.....	.....	.....	— 8	—28	36.5	2	61	32.5	38	27
9	50	40	67	44	62	38	31	22	16.5	4	.....	.....	.....	.....	.....	.....	— 6.5	—18	43.5	3	66	38.5	60	30.5
10	62	51.5	46	42	63	46	28	18.5	36	8.5	.....	.....	.....	.....	.....	.....	— 6.5	—28	50	12	59	42	61	35
11	65	50	48	39	74	45	27	15	9	—11	.....	.....	.....	.....	.....	.....	— 7	—36	41	18.5	67	40.5	61.5	32
12	68.5	49.5	50	39	72	40	20	9.5	5	—12.5	.....	.....	.....	.....	.....	.....	—12	—34	38	19	64	38.5	47	33.5
13	61	52	76	40	51	35	20	16	— 5	—16.5	.....	.....	.....	.....	.....	.....	— 6	—30	33.5	14	56	38	55	28
14	60	48	70	40	42	32	19	14.5	— 9	—22	.....	.....	.....	.....	.....	.....	—16.5	—24	34	12	69.5	39	57	34.5
15	60	48.5	71	44	41	33	36	14.5	— 7.5	—24	.....	.....	.....	.....	.....	.....	—21	—32	41	14.5	76	41	53.5	32
16	75	44.5	61	46	53	38	30	14	6	—14	.....	.....	.....	.....	.....	.....	—12	—32	44	19	46.5	33	57	35
17	72	44	76	45.5	53	28	36.5	25	— 6	—21	.....	.....	.....	.....	.....	.....	—13	—31	40	27	37	32	46	32.5
18	62	49	51	40.5	52	41	35	27	0	—14.5	.....	.....	.....	.....	.....	.....	— 0.5	—16	43	26	36	26	49	31
19	56	42	54	37.5	52	37.5	35	27	16	— 3	.....	.....	.....	.....	.....	.....	0	—15.5	51	30	42	21	68.5	36
20	50	40.5	70	39	60	49.5	34	32	21	12	.....	.....	.....	.....	.....	.....	— 1	—17	43	31.5	56	36.5	56	39
21	51	41.5	80	39	68	46	37	33	23	17.5	.....	.....	.....	.....	.....	.....	— 6.5	—22	40.5	33	69.5	46	74	37
22	73	42.5	86	58.5	69	49.5	37.5	32	17.5	— 5	.....	.....	.....	.....	.....	.....	0	—22.5	33.5	28	82	57.5	61	32
23	60	39.5	71	50	62.5	41.5	35	32	11	2	.....	.....	.....	.....	.....	.....	5	—13.5	35	17.5	79.5	49.5	68.5	32
24	91	50	55	42	55	38	34	31	21	1	.....	.....	.....	.....	.....	.....	19	— 8.5	23	1	73.5	46.5	59	32.5
25	82	57.5	55	41.5	48	40.5	31	21.5	8	—15	.....	.....	.....	.....	24	0	22.5	0.5	27.5	4	69	41.5	57	34
26	57	56	57	38	47.5	34	21.5	8	17.5	—20	.....	.....	.....	.....	34	0.5	21.5	3	26	2.5	73	36	47.5	35
27	65	54.5	60	29	43.5	36	26.5	9.5	—14	—25	.....	.....	.....	.....	26	— 7	6	—16	35.5	11	38.5	33	57	31.5
28	65	47.5	68.5	42	41.5	31	32.5	22	— 9	—25	.....	.....	.....	.....	— 5	—19	36	—17	40	20.5	49	29	66	39
29	63	43	67	57	36	31	37	32.5	—14	—25.5	.....	.....	.....	.....	*	*	10.5	— 6	48	33	48.5	26	86	38.5
30	85	45	63	48	33	28.5	33	32	—13	—25	.....	.....	.....	.....	.....	.....	20	— 6	54	21.5	40.5	25.5	91	27.5
31	99	64.5	54	47.5	.....	.....	32	28	.....	.....	.....	.....	.....	.....	.....	.....	12	3.5	.....	.....	34	25	.....	.....
Range	51°.5		48°.5		46°		34°		60°.5		.....		.....		.....		79°		76°		73°.5		60°	
Monthly means	.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....		.....	

*Records not received at office of Chief Signal-Officer.

STATION STATISTICS.

PAPER 20.

Statement showing how many times the wind was observed blowing from the eight cardinal points of the compass during each month and season of the year ending June 30, 1877, compiled from the local observations taken at the several stations of observations at 7 a. m., 2 p. m., and 9 p. m. (local time).

Station.	Wind.	July, 1876.	August.	September.	October.	November.	December.	January, '77.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Albany, N. Y.	N.	3	5	7	1	6	3	5	2	2	4	12	0	18	8	14	10
	N. W.	16	15	15	21	26	25	24	24	20	21	26	23	67	54	62	73
	W.	6	3	5	4	2	5	5	6	9	12	13	9	34	18	11	16
	S. W.	0	6	1	3	0	2	0	0	5	1	0	3	6	9	4	2
	S.	24	17	13	23	8	13	16	10	12	6	5	33	23	74	44	39
	S. E.	0	0	3	4	4	0	1	4	9	5	1	4	15	4	11	5
	E.	0	1	1	0	0	0	0	0	0	0	0	1	0	2	1	0
	N. E.	0	0	0	0	0	0	0	2	1	1	1	0	3	0	0	2
	Calm.	44	46	45	37	44	45	42	36	35	40	35	17	110	107	126	123
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alpena, Mich	N.	7	3	6	0	7	3	3	10	5	7	12	4	24	14	13	16
	N. W.	24	16	27	24	20	35	27	25	37	22	24	18	83	58	71	87
	W.	8	6	9	22	15	17	13	13	9	1	3	10	13	24	46	43
	S. W.	9	8	10	20	14	27	26	16	14	1	2	16	17	33	44	69
	S.	8	8	0	2	2	4	11	0	2	2	4	5	8	21	4	15
	S. E.	19	35	16	20	14	0	6	8	11	25	29	25	65	79	50	14
	E.	8	1	13	4	6	1	0	6	2	16	10	3	28	12	23	7
	N. E.	5	5	7	1	8	4	4	0	8	14	3	3	25	13	16	8
	Calm.	5	11	2	0	4	2	3	6	5	2	6	6	13	22	6	11
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atlantic City, N. J	N.	4	8	7	10	14	10	9	7	12	11	8	5	31	17	31	26
	N. W.	9	7	11	14	20	22	12	17	14	8	12	2	34	18	45	51
	W.	13	8	9	22	19	30	24	19	16	6	12	7	34	28	50	73
	S. W.	26	12	10	13	3	14	16	14	9	11	26	31	46	69	26	44
	S.	22	14	10	14	7	5	5	8	21	12	10	20	43	56	31	18
	S. E.	0	8	9	1	2	2	3	1	4	7	1	1	12	9	12	6
	E.	6	18	16	3	13	3	5	7	10	14	5	9	29	33	32	15
	N. E.	8	13	13	8	5	7	14	7	6	20	11	7	37	28	26	28
	Calm.	5	5	5	8	7	0	5	4	1	1	8	8	10	18	20	9
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Augusta, Ga	N.	3	6	5	7	10	4	6	8	3	10	2	1	15	10	22	18
	N. W.	8	16	20	18	24	35	21	25	27	14	20	18	61	42	62	81
	W.	5	2	3	6	9	4	8	9	7	3	1	2	11	9	18	21
	S. W.	8	5	5	3	4	6	10	6	16	14	4	10	34	23	12	22
	S.	25	5	8	4	2	4	9	1	11	13	8	14	32	44	14	14
	S. E.	15	18	9	5	8	3	2	2	21	12	20	13	53	46	22	7
	E.	5	11	1	5	5	3	7	8	2	2	6	13	10	29	11	18
	N. E.	8	2	6	9	9	8	6	11	1	9	14	6	24	16	24	25
	Calm.	16	28	33	36	19	26	24	14	5	13	18	13	36	57	88	64
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baltimore, Md.	N.	8	8	12	4	17	6	4	5	6	13	6	5	25	21	33	15
	N. W.	19	14	11	23	24	31	24	30	32	13	29	12	74	45	58	85
	W.	15	4	10	15	6	12	5	6	2	4	6	3	12	23	31	23
	S. W.	13	2	10	9	11	14	11	3	13	4	10	24	27	39	30	28
	S.	10	11	2	4	4	1	4	1	4	2	2	10	8	31	10	6
	S. E.	15	23	10	9	2	3	5	6	17	10	18	22	45	59	21	14
	E.	2	7	6	6	2	2	3	0	3	14	3	7	20	16	14	5
	N. E.	9	17	25	12	16	10	12	7	7	21	7	4	35	30	53	29
	Calm.	2	8	4	11	8	14	25	26	9	9	12	3	30	13	23	65
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barnegat, N. J.	N.	2	7	11	17	12	16	12	10	8	9	5	3	22	12	40	38
	N. W.	10	11	11	18	26	34	25	31	31	18	18	9	67	30	55	90
	W.	14	7	13	16	12	15	13	5	2	3	5	9	10	30	41	33
	S. W.	26	11	5	16	5	10	19	11	10	3	22	14	35	51	26	40
	S.	25	17	12	9	3	4	7	8	15	12	16	36	43	78	24	19
	S. E.	4	15	9	3	4	1	2	4	9	15	12	8	36	27	16	7
	E.	4	17	22	5	16	4	5	9	7	12	6	7	25	28	43	18
	N. E.	8	7	7	9	12	8	9	6	11	17	8	3	36	18	28	23
	Calm.	0	1	0	0	0	1	1	0	0	1	1	1	2	2	0	2
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1876.	August.	September.	October.	November.	December.	January, '77.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Bismarck, D. T.	N.	10	10	12	8	6	3	7	3	13	23	5	14	41	34	26	13
	N. W.	19	18	14	25	25	26	32	28	12	16	8	34	52	71	64	68
	W.	1	2	1	1	2	1	3	3	3	3	4	8	10	11	4	7
	S. W.	7	2	0	1	5	4	11	4	6	5	3	1	14	10	6	19
	S.	19	17	2	6	2	2	2	8	6	9	28	4	43	40	10	12
	S. E.	13	11	10	8	4	22	5	7	10	5	12	6	27	30	22	34
	E.	10	6	4	0	2	7	2	1	8	7	16	6	31	22	6	10
	N. E.	5	9	17	8	12	4	6	17	12	17	8	10	37	24	37	27
	Calm.	9	18	30	36	32	22	25	13	7	5	9	7	21	34	98	60
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boston, Mass.	N.	5	6	6	3	15	8	11	6	8	5	9	0	22	11	24	25
	N. W.	8	12	12	5	17	24	11	20	15	17	9	12	41	32	34	55
	W.	21	14	14	45	29	41	37	25	27	10	24	16	61	51	88	103
	S. W.	21	16	13	24	3	11	19	15	9	4	12	21	25	58	40	45
	S.	10	16	12	8	3	2	9	5	6	4	4	11	14	37	23	16
	S. E.	13	15	9	2	4	2	2	5	9	10	12	9	31	37	15	9
	E.	8	10	10	4	8	2	2	1	8	26	15	13	49	31	22	5
	N. E.	6	2	13	1	9	0	1	6	10	13	8	8	31	16	23	7
	Calm.	1	2	1	1	2	3	1	1	1	1	0	0	2	3	4	5
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Breckinridge, Minn.	N.	14	9	13	7	6	4	7	18	24	22	14	21	60	44	26	29
	N. W.	8	10	27	28	42	29	23	14	27	3	0	18	30	36	97	66
	W.	6	10	7	10	10	12	13	7	8	9	11	14	28	30	27	32
	S. W.	3	6	4	11	4	5	9	3	2	4	4	4	10	13	19	17
	S.	9	5	1	1	2	1	3	3	10	6	14	13	30	27	4	7
	S. E.	30	37	18	26	20	22	20	26	14	13	38	11	65	78	64	68
	E.	12	12	14	6	0	5	3	5	3	10	6	6	19	30	20	13
	N. E.	9	3	3	4	2	0	0	3	2	15	3	1	20	13	9	3
	Calm.	2	1	3	0	4	15	15	5	3	8	3	2	14	5	7	35
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Buffalo, N. Y.	N.	6	6	8	4	3	7	6	4	4	5	6	0	15	12	15	17
	N. W.	8	5	13	20	17	15	4	12	10	5	4	5	19	18	50	31
	W.	16	23	19	28	18	35	24	21	23	13	30	24	66	63	65	80
	S. W.	36	23	4	13	6	10	39	23	21	14	20	30	55	89	23	72
	S.	1	5	0	9	7	4	5	0	4	5	0	4	9	10	16	9
	S. E.	4	2	4	3	2	3	1	1	3	3	0	0	6	6	9	5
	E.	5	16	30	9	19	15	8	8	19	24	13	9	56	30	58	31
	N. E.	10	6	9	2	6	3	4	5	4	15	10	10	29	26	17	12
	Calm.	7	7	3	5	12	1	2	10	5	6	10	8	21	22	20	13
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington, Vt.	N.	22	26	35	13	40	27	24	25	25	43	47	20	115	68	88	76
	N. W.	2	1	1	11	1	6	1	4	7	1	5	8	13	11	13	11
	W.	10	14	10	20	6	13	9	9	12	3	1	11	16	35	36	31
	S. W.	4	1	1	1	0	0	0	1	3	3	5	5	11	10	2	1
	S.	33	37	27	40	19	24	43	27	30	15	20	39	65	109	86	94
	S. E.	0	0	2	0	2	6	0	1	2	8	0	1	10	1	4	7
	E.	1	4	9	1	9	7	3	2	1	4	1	0	6	5	19	12
	N. E.	1	0	1	0	1	6	5	0	1	5	0	1	6	2	2	11
	Calm.	20	10	4	7	12	4	8	15	12	8	14	5	34	35	23	27
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cairo, Ill.	N.	12	9	20	11	13	20	22	29	28	12	17	2	57	23	44	71
	N. W.	3	0	10	7	16	9	8	8	8	3	5	4	16	7	33	25
	W.	4	0	9	12	15	15	6	5	7	14	5	10	26	14	36	26
	S. W.	6	8	2	9	4	5	6	4	5	3	2	9	10	23	15	15
	S.	36	23	20	27	16	24	26	13	21	21	22	38	64	97	63	63
	S. E.	4	10	5	4	5	7	8	2	11	3	9	4	23	18	14	17
	E.	6	18	4	3	4	3	3	3	6	15	15	15	36	39	11	9
	N. E.	8	16	4	6	6	3	4	4	5	12	15	3	32	27	16	11
	Calm.	14	9	16	14	11	7	10	16	2	7	3	5	12	28	41	33
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cape Hatteras, N. C.	N.	1	1	5	23	13	17	14	8	7	2	5	0	14	2	41	39
	N. W.	0	4	7	2	7	12	6	5	9	5	6	3	20	7	16	23
	W.	7	10	12	12	13	21	17	13	10	9	9	7	28	24	37	51
	S. W.	33	12	13	9	11	11	19	6	13	17	16	24	48	69	33	36
	S.	22	13	3	0	3	2	3	1	10	7	1	21	18	56	6	6
	S. E.	2	10	11	1	6	2	2	3	10	7	4	13	21	25	18	7
	E.	3	13	8	4	2	2	3	2	4	5	5	5	14	21	14	7
	N. E.	19	15	27	33	32	24	26	44	27	37	43	16	107	50	92	94
	Calm.	6	15	4	9	3	2	3	2	3	1	2	1	6	22	16	7
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1876.	August.	September.	October.	November.	December.	January, '77.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Cape Henry, Va	N.	3	9	6	6	21	10	24	24	10	11	10	2	31	14	33	58
	N. W.	9	7	16	26	21	31	14	16	23	12	17	9	52	25	63	61
	W.	8	5	12	3	5	18	12	11	7	5	13	5	25	18	20	41
	S. W.	23	12	9	20	12	16	16	11	5	10	5	13	20	48	41	43
	S.	15	6	5	3	7	5	4	3	12	12	3	17	27	38	15	12
	S. E.	15	23	16	8	4	2	7	6	18	9	11	21	38	59	28	15
	E.	7	10	9	4	2	1	5	2	9	6	17	7	32	24	15	8
	N. E.	11	11	12	12	9	10	10	9	9	22	13	16	44	38	33	29
	Calm.	2	10	5	11	9	0	1	2	0	3	4	0	7	12	25	3
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cape Lookout, N. C.	N.	4	7	13	21	13	16	8	3	9	12	10	0	31	11	47	27
	N. W.	1	2	4	6	15	16	16	9	17	3	9	4	29	7	25	41
	W.	10	9	9	8	10	12	8	6	6	10	10	4	26	23	27	26
	S. W.	48	16	23	15	12	16	21	14	21	16	17	34	54	98	50	51
	S.	7	22	9	2	4	2	3	2	10	18	2	18	30	47	15	7
	S. E.	2	5	4	5	5	0	4	3	3	4	3	7	10	14	14	7
	E.	3	12	11	4	1	1	4	1	8	11	18	7	37	22	16	6
	N. E.	18	14	14	32	26	23	27	35	13	12	15	11	40	43	72	85
	Calm.	0	6	3	0	4	7	2	11	6	4	9	5	19	11	7	20
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cape May, N. J	N.	5	8	9	17	37	22	18	15	13	7	3	3	23	16	63	55
	N. W.	12	12	12	23	19	24	24	27	26	13	20	2	59	26	54	75
	W.	12	6	10	11	4	15	9	10	3	12	8	6	23	24	25	34
	S. W.	10	5	9	11	2	6	10	4	7	1	12	6	20	21	22	20
	S.	43	20	9	11	6	8	9	10	20	12	20	36	52	99	28	27
	S. E.	5	10	4	8	5	2	4	7	10	11	15	18	36	33	17	13
	E.	1	25	23	4	10	4	11	8	8	22	5	12	35	38	37	24
	N. E.	3	6	14	8	7	12	7	3	6	11	8	6	25	15	29	22
	Calm.	2	1	0	0	0	0	1	0	0	1	2	1	3	4	0	1
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Charleston, S. C.	N.	5	7	7	14	20	23	15	26	6	5	16	2	27	14	41	64
	N. W.	3	6	5	10	8	15	6	7	8	15	5	5	28	14	23	28
	W.	6	5	18	11	12	19	10	8	11	7	6	5	24	16	51	37
	S. W.	46	30	20	17	17	13	13	15	15	4	1	21	20	97	54	41
	S.	12	8	16	4	1	9	24	6	30	35	15	33	80	53	21	39
	S. E.	5	17	6	9	5	1	3	1	3	5	5	7	13	29	20	5
	E.	9	12	8	6	3	5	16	10	14	8	17	8	39	29	17	31
	N. E.	7	8	8	22	14	8	5	11	6	11	28	9	45	24	44	24
	Calm.	0	0	2	0	0	0	1	0	0	0	0	0	0	0	2	1
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheyenne, W. T	N.	6	11	18	10	12	12	8	12	12	17	11	13	40	30	40	32
	N. W.	16	11	21	31	28	32	25	19	16	15	13	15	44	42	80	82
	W.	13	18	10	24	28	18	31	16	30	15	11	18	56	49	62	65
	S. W.	15	17	10	10	14	15	13	12	17	6	11	7	34	39	34	40
	S.	25	15	7	8	4	8	9	9	9	14	17	19	40	59	19	26
	S. E.	6	8	13	5	2	1	1	7	2	10	19	8	31	22	20	9
	E.	5	8	0	2	0	0	5	5	3	5	4	3	12	16	2	10
	N. E.	7	5	8	2	1	1	1	3	2	5	6	7	13	19	11	5
	Calm.	0	0	3	1	1	0	0	1	2	3	1	0	6	0	5	1
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chicago, Ill.	N.	20	11	23	6	5	3	5	22	27	30	5	6	62	37	34	30
	N. W.	7	4	14	9	20	21	4	8	11	4	1	6	16	17	43	33
	W.	2	3	5	16	8	16	13	10	3	2	5	13	10	18	29	39
	S. W.	21	10	4	25	19	23	39	15	19	10	14	22	43	53	48	77
	S.	10	22	11	18	23	12	15	11	11	10	12	8	33	40	52	38
	S. E.	9	16	5	11	5	8	6	5	4	3	10	8	17	33	21	19
	E.	4	10	8	5	5	3	1	5	8	7	11	8	26	22	18	9
	N. E.	19	12	15	3	3	3	5	5	9	20	32	16	61	47	21	13
	Calm.	1	5	5	0	2	4	5	3	1	4	3	3	8	9	7	12
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cincinnati, Ohio	N.	3	4	8	4	11	8	5	5	11	8	12	6	31	13	23	18
	N. W.	6	9	18	10	18	18	17	21	19	3	6	10	28	25	46	56
	W.	11	11	16	17	14	14	13	7	5	5	6	7	16	29	47	34
	S. W.	20	14	11	21	8	25	18	15	14	14	6	15	34	49	40	58
	S.	10	7	7	15	11	5	15	6	11	6	3	15	20	32	33	26
	S. E.	11	12	11	11	12	12	18	8	17	9	23	27	49	50	34	38
	E.	4	12	4	7	7	3	6	5	8	17	11	2	36	18	18	14
	N. E.	21	13	14	7	8	8	0	17	8	21	15	6	44	40	29	25
	Calm.	7	11	1	1	1	0	1	0	0	7	10	2	17	20	3	1
	Blank.	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1876.	August.	September.	October.	November.	December.	January, '77.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Cleveland, Ohio	N.	15	17	20	7	12	11	5	16	11	20	16	17	47	49	39	32
	N. W.	5	5	7	8	5	2	4	9	15	5	15	6	35	16	20	15
	W.	11	6	10	7	6	7	5	14	13	9	8	8	30	25	23	26
	S. W.	12	6	9	24	22	27	27	17	17	11	10	13	38	31	55	71
	S.	10	6	8	19	18	20	24	12	12	4	10	20	26	36	45	56
	S. E.	15	21	9	17	20	17	24	5	14	11	7	13	32	49	46	46
	E.	6	11	13	9	2	4	1	3	3	6	5	5	14	22	24	8
	N. E.	13	17	11	2	4	4	3	8	7	20	18	2	45	32	17	15
	Calm.	6	4	3	0	1	1	0	0	1	4	4	6	9	16	4	1
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corsicana, Tex	N.	0	5	17	8	30	19	17	20	18	12	2	3	32	8	55	56
	N. W.	1	0	4	8	15	13	16	16	9	17	7	3	33	4	27	45
	W.	1	0	2	1	3	6	1	5	2	9	1	0	12	1	6	12
	S. W.	3	3	0	8	2	7	7	3	3	4	3	0	10	6	10	17
	S.	32	24	24	31	14	20	34	9	33	10	25	53	68	109	69	63
	S. E.	38	45	19	13	15	10	5	7	18	20	43	23	81	106	47	22
	E.	15	12	9	5	0	3	5	7	1	6	8	1	15	28	14	15
	N. E.	1	4	13	15	4	6	5	14	4	11	2	3	17	8	32	25
	Calm.	2	0	2	4	7	9	3	3	5	1	2	4	8	6	13	15
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Davenport, Iowa	N.	5	9	9	4	8	6	2	11	14	4	1	3	19	17	21	19
	N. W.	7	8	17	17	27	26	11	10	12	13	4	10	29	25	61	47
	W.	5	4	6	17	12	16	16	5	9	1	3	7	13	16	35	37
	S. W.	19	9	8	25	12	16	17	20	8	6	11	17	25	45	45	53
	S.	13	16	4	4	8	5	6	0	5	5	17	13	27	42	16	11
	S. E.	7	22	9	8	10	1	3	3	7	6	17	7	30	36	27	7
	E.	17	13	19	7	2	4	4	7	16	20	19	10	55	40	28	15
	N. E.	13	6	9	2	6	11	7	12	15	28	13	11	56	30	17	30
	Calm.	7	6	9	9	5	8	27	16	7	7	8	12	22	25	23	51
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Denison, Tex	N.	..	....	....	....	....	....	....	....	15	12	3	2	30	....	....	....
	N. W.	....	....	....	....	....	....	....	....	13	17	8	5	38	....	....	....
	W.	....	....	....	....	....	....	....	....	3	9	0	0	12	....	....	....
	S. W.	....	....	....	....	....	....	....	....	9	5	12	7	26	....	....	....
	S.	....	....	....	....	....	....	....	....	21	9	26	34	56	....	....	....
	S. E.	....	....	....	....	....	....	....	....	19	20	34	32	73	....	....	....
	E.	....	....	....	....	....	....	....	....	3	3	9	3	15	....	....	....
	N. E.	....	....	....	....	....	....	....	....	9	14	1	7	24	....	....	....
	Calm.	....	....	....	....	....	....	....	....	1	1	0	0	2	....	....	....
	Blank.	....	....	....	....	....	....	....	....	0	0	0	0	0	....	....	....
Denver, Colo	N.	8	15	11	9	11	12	13	12	15	11	9	14	35	37	31	37
	N. W.	8	7	8	16	13	5	6	3	19	9	11	11	39	26	37	14
	W.	7	9	7	7	4	6	6	2	14	2	8	10	24	26	18	14
	S. W.	3	4	5	2	6	3	6	1	5	10	8	5	23	19	13	10
	S.	39	35	24	31	36	42	42	37	20	24	27	17	71	91	91	121
	S. E.	11	4	3	4	8	4	0	7	2	10	3	6	15	21	15	11
	E.	6	4	4	5	4	2	2	4	6	8	6	4	20	14	13	8
	N. E.	2	5	19	11	7	13	8	7	8	8	6	7	22	14	37	28
	Calm.	9	10	9	8	1	6	10	11	4	8	15	16	27	35	18	27
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Detroit, Mich	N.	4	5	12	6	11	7	2	15	9	4	8	2	21	11	29	24
	N. W.	6	11	14	14	10	16	5	9	16	4	6	5	26	22	38	30
	W.	9	2	14	18	17	23	25	15	12	7	8	12	27	23	49	63
	S. W.	33	24	8	26	18	20	34	25	20	9	26	31	55	88	52	79
	S.	4	13	2	10	10	5	8	1	3	5	2	9	10	26	22	14
	S. E.	4	11	2	2	7	3	1	2	4	4	6	3	14	18	11	6
	E.	12	13	22	15	7	0	1	7	9	22	16	15	47	40	44	8
	N. E.	21	10	15	1	6	11	9	9	15	29	17	11	61	42	22	29
	Calm.	0	4	1	1	4	8	8	1	5	6	4	2	15	6	6	17
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dodge City, Kans	N.	5	9	13	16	37	24	16	20	17	29	15	12	61	26	66	60
	N. W.	0	3	7	7	16	18	20	6	9	7	1	5	17	8	30	44
	W.	5	3	0	9	7	11	16	8	7	0	1	3	8	11	16	35
	S. W.	2	1	3	12	8	10	13	11	14	8	10	10	32	13	29	34
	S.	18	33	19	22	9	10	11	10	16	14	40	16	70	67	50	31
	S. E.	26	24	17	7	4	4	4	10	8	8	20	15	36	65	28	18
	E.	32	16	12	2	0	5	0	4	2	9	1	16	12	64	14	9
	N. E.	4	4	15	7	5	9	13	14	17	15	5	12	37	20	27	36
	Calm.	1	0	4	5	4	2	0	1	3	0	0	1	3	2	13	3
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1876.	August.	September.	October.	November.	December.	January, '77.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Dubuque, Iowa	N.	4	2	6	0	6	8	6	8	5	10	3	12	18	18	12	22
	N. W.	11	13	25	12	25	27	13	12	20	10	5	20	35	44	62	52
	W.	6	6	2	22	17	11	13	4	10	3	3	13	16	25	41	28
	S. W.	8	6	2	22	10	7	8	10	7	3	12	13	22	27	34	25
	S.	21	18	11	9	16	6	7	0	4	15	23	14	42	53	36	13
	S. E.	9	30	9	14	12	2	3	4	9	12	29	7	50	46	35	9
	E.	10	2	11	2	0	2	0	1	8	11	5	6	24	18	13	3
	N. E.	10	5	11	2	0	5	1	8	14	22	12	5	46	20	13	14
	Calm.	14	11	13	10	4	25	42	37	16	4	1	0	21	25	27	104
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Duluth, Minn	N.	3	5	7	4	13	5	15	4	8	7	4	4	19	12	24	24
	N. W.	15	12	18	13	27	27	8	7	16	8	2	14	26	41	58	42
	W.	5	9	8	14	8	6	26	11	11	7	1	10	19	24	30	43
	S. W.	14	14	15	27	11	29	19	20	22	11	5	13	38	41	53	68
	S.	0	1	3	1	5	0	0	1	0	0	0	2	0	3	9	1
	S. E.	1	0	1	0	4	0	0	1	0	0	2	0	2	1	5	1
	E.	2	1	1	10	7	1	1	0	3	1	13	5	17	8	18	2
	N. E.	33	41	28	18	4	2	5	21	23	43	53	38	119	112	50	28
	Calm.	20	10	9	6	11	23	19	19	10	13	13	4	36	34	26	61
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eastport, Me	N.	4	3	9	0	21	10	8	12	11	16	20	7	47	14	30	30
	N. W.	14	15	14	28	23	27	21	24	15	13	11	11	39	40	65	72
	W.	4	13	8	18	8	24	26	12	11	2	5	8	18	25	34	62
	S. W.	13	12	7	17	3	11	14	12	10	7	11	13	28	38	27	37
	S.	32	30	17	15	4	3	7	9	15	10	15	37	40	99	36	19
	S. E.	5	1	1	2	6	2	1	1	3	5	2	2	10	8	9	4
	E.	2	1	10	7	6	5	3	1	11	13	3	4	27	7	23	9
	N. E.	3	0	12	2	18	7	7	6	10	15	13	2	38	5	32	20
	Calm.	16	18	12	4	1	4	6	7	7	9	13	6	29	40	17	17
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erie, Pa	N.	4	10	5	2	6	4	1	4	4	4	6	9	14	23	13	9
	N. W.	13	8	13	17	11	14	5	7	6	8	15	5	29	26	41	26
	W.	28	13	9	11	10	18	12	13	18	9	12	7	39	48	30	43
	S. W.	13	4	6	21	16	20	28	28	22	12	14	20	48	37	43	76
	S.	14	24	16	20	20	18	26	7	16	9	10	20	35	58	56	51
	S. E.	5	18	17	13	14	8	12	5	5	7	4	7	16	30	44	25
	E.	5	5	8	3	5	6	1	0	3	7	5	5	15	15	16	7
	N. E.	5	4	13	4	7	4	5	10	14	22	23	12	59	21	24	19
	Calm.	6	7	3	2	1	1	3	10	5	12	4	5	21	18	6	14
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Escanaba, Mich	N.	20	9	26	9	17	12	13	27	24	36	30	18	90	47	52	52
	N. W.	4	5	12	15	18	27	18	7	14	7	1	7	22	16	45	52
	W.	10	8	12	19	10	22	10	1	11	2	1	7	14	25	41	33
	S. W.	8	11	7	18	14	14	20	12	10	1	3	6	14	25	39	46
	S.	30	45	15	11	6	6	23	21	16	24	39	34	79	109	32	50
	S. E.	5	2	4	9	12	1	2	1	5	9	7	5	21	12	25	4
	E.	2	1	3	6	3	1	0	1	4	1	4	2	9	5	12	2
	N. E.	7	2	8	5	7	2	3	5	6	9	4	6	19	15	20	10
	Calm.	7	10	3	1	3	8	4	9	3	1	4	5	8	22	7	21
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fort Gibson, Ind. T.	N.	0	1	9	9	25	18	17	17	15	21	3	6	39	7	43	32
	N. W.	4	1	7	7	14	16	12	19	18	7	9	3	34	8	28	47
	W.	5	2	12	1	2	5	6	7	2	7	2	0	11	7	15	18
	S. W.	6	1	4	8	5	4	5	6	1	2	2	6	5	13	17	15
	S.	15	6	6	15	10	6	20	11	22	15	31	37	68	58	31	37
	S. E.	23	34	21	27	20	16	18	8	27	21	33	25	81	92	68	42
	E.	33	30	23	19	10	14	8	10	4	10	13	12	27	75	52	32
	N. E.	6	17	6	5	0	7	4	2	2	4	0	0	6	23	11	13
	Calm.	1	1	2	2	4	7	3	4	2	3	0	1	5	3	8	14
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fort Sully, Dak	N.	14	11	21	....	....	0	0	3	3	4	1	2	8	27	...	3
	N. W.	13	14	16	....	....	35	46	34	39	37	15	49	91	76	....	115
	W.	4	4	2	....	....	12	4	4	0	3	4	1	7	9	....	20
	S. W.	2	3	0	....	....	3	2	2	0	3	1	2	4	7	....	7
	S.	21	6	2	....	....	3	0	1	4	3	8	3	15	30	....	4
	S. E.	35	42	25	....	....	20	8	29	30	22	59	29	111	106	....	57
	E.	1	2	15	....	....	4	4	0	7	6	2	1	15	4	....	8
	N. E.	1	11	6	....	....	4	4	3	9	7	1	0	17	12	....	71
	Calm.	2	0	3	....	....	12	25	11	1	5	2	3	8	5	....	48
	Blank.	0	0	0	....	....	0	0	0	0	0	0	0	0	0	....	0

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1876.	August.	September.	October.	November.	December.	January, '77.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Galveston, Tex.	N.	3	6	14	13	25	23	30	21	11	13	9	9	33	18	58	74
	N. W.	8	4	12	3	6	11	7	7	7	10	4	1	21	13	21	25
	W.	6	4	1	0	1	3	3	4	7	3	1	0	11	10	2	10
	S. W.	12	8	3	6	6	4	1	2	6	8	3	1	17	21	15	7
	S.	20	26	17	13	6	8	6	4	19	9	8	36	36	82	36	18
	S. E.	33	28	16	35	16	6	15	8	32	31	50	34	113	95	67	29
	E.	7	7	9	7	14	22	23	20	9	12	13	4	34	18	30	65
	N. E.	3	6	16	13	16	16	5	17	2	4	4	4	10	13	45	38
	Calm.	1	4	2	3	0	0	3	1	0	0	1	1	1	6	5	4
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Haven, Mich.	N.	5	3	8	5	7	14	10	10	9	5	8	2	22	10	20	34
	N. W.	20	12	20	19	13	14	10	14	19	10	16	9	45	41	52	38
	W.	10	15	7	18	12	16	13	12	17	11	7	20	35	45	37	41
	S. W.	20	14	5	16	8	12	21	12	8	8	7	16	23	50	29	45
	S.	9	19	8	7	7	4	9	17	4	6	20	21	30	49	22	30
	S. E.	6	10	5	10	16	9	16	0	8	5	6	3	19	19	31	25
	E.	9	9	25	12	9	13	5	7	11	32	11	5	54	23	46	25
	N. E.	8	5	9	5	15	9	8	11	14	8	10	5	32	18	29	28
	Calm.	6	6	3	1	3	2	1	1	3	5	8	9	16	21	7	4
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indianapolis, Ind.	N.	9	6	12	4	5	8	0	6	14	9	9	3	32	18	21	14
	N. W.	8	13	15	10	17	15	15	21	18	4	15	10	37	31	42	51
	W.	7	6	17	12	16	16	12	8	13	6	2	9	21	22	45	36
	S. W.	19	7	8	19	7	18	17	14	6	9	5	18	20	44	34	49
	S.	12	13	8	17	11	11	14	4	9	6	8	20	23	45	36	28
	S. E.	10	19	6	12	14	6	17	5	18	12	20	14	50	43	32	28
	E.	5	8	7	1	0	3	2	2	4	15	11	1	30	14	8	7
	N. E.	9	12	11	1	6	6	4	15	8	22	10	5	40	26	18	25
	Calm.	14	9	6	17	14	10	12	9	3	7	13	10	23	33	37	31
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indianola, Tex.	N.	0	0	12	11	29	34	37	15	10	11	7	10	28	10	52	86
	N. W.	0	0	4	3	3	2	5	9	5	11	1	1	17	1	10	16
	W.	1	1	0	2	4	3	1	0	4	2	1	0	7	0	6	4
	S. W.	4	6	0	1	1	3	1	1	3	2	0	0	5	10	2	5
	S.	40	27	15	29	14	6	10	1	23	13	17	39	53	106	58	17
	S. E.	33	37	30	22	11	2	4	10	30	26	42	28	98	98	63	16
	E.	8	13	12	11	11	15	28	28	9	17	21	5	47	26	34	71
	N. E.	3	5	16	12	13	20	5	18	8	8	4	5	20	13	41	43
	Calm.	4	4	1	2	4	8	2	2	1	0	0	2	1	12	7	12
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jacksonville, Fla.	N.	5	2	4	27	9	11	7	10	1	1	5	0	7	7	40	28
	N. W.	1	1	5	20	16	25	11	19	11	15	10	1	36	3	41	55
	W.	1	2	3	6	14	4	4	6	16	6	7	7	29	10	23	14
	S. W.	14	18	27	4	16	12	15	8	13	15	5	18	33	50	47	35
	S.	23	6	8	1	6	4	12	2	9	13	10	12	32	41	15	18
	S. E.	24	7	14	2	2	3	5	5	13	21	3	13	37	44	18	13
	E.	9	20	3	0	3	4	2	2	8	6	12	22	26	51	6	8
	N. E.	13	31	18	25	13	24	14	18	18	8	39	9	65	53	56	56
	Calm.	3	6	8	8	11	6	23	14	4	5	2	8	11	17	27	43
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Keokuk, Iowa.	N.	8	13	21	12	9	24	8	24	22	14	5	13	41	34	42	56
	N. W.	5	4	15	16	29	24	19	10	13	10	5	9	28	18	60	53
	W.	9	4	5	14	8	13	18	12	8	3	7	13	18	26	27	43
	S. W.	14	5	5	19	7	11	17	13	6	4	9	18	19	37	31	41
	S.	10	24	13	12	13	5	10	4	9	5	15	11	29	45	38	19
	S. E.	12	18	17	12	13	1	6	1	10	14	23	10	47	40	42	8
	E.	17	14	3	3	3	2	5	9	8	17	19	5	44	36	9	16
	N. E.	9	9	2	2	1	8	7	8	14	23	9	8	46	26	5	23
	Calm.	9	2	9	3	7	5	3	3	3	0	1	3	4	14	19	11
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Key West, Fla.	N.	2	5	1	6	17	16	4	39	6	9	15	1	30	8	24	59
	N. W.	0	10	5	6	4	0	3	4	15	5	10	0	30	10	15	7
	W.	1	4	1	1	0	0	2	0	6	10	5	0	21	5	2	2
	S. W.	2	4	7	6	1	4	0	5	3	4	1	5	8	11	14	9
	S.	8	3	9	2	0	3	0	1	1	3	5	14	9	25	11	4
	S. E.	35	20	23	21	11	16	18	8	8	15	16	27	39	82	55	42
	E.	33	40	19	25	6	3	9	3	11	23	21	28	55	101	50	15
	N. E.	4	3	22	26	50	51	57	23	43	16	15	9	74	16	98	131
	Calm.	8	4	3	0	1	0	0	1	0	4	5	6	9	18	4	1
	Blank.	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1876.	August.	September.	October.	November.	December.	January, '77.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Kittyhawk, N. C.	N.	6	3	7	10	20	10	23	20	20	13	19	7	52	16	37	53
	N. W.	1	3	12	16	15	29	7	6	14	1	3	0	18	4	43	42
	W.	17	14	11	11	13	16	17	13	2	8	6	9	16	40	35	46
	S. W.	33	17	10	9	12	17	22	13	12	14	15	24	41	74	31	52
	S.	2	10	7	1	2	1	1	2	13	9	6	14	28	26	10	4
	S. E.	10	11	11	4	4	2	3	2	12	7	4	7	23	28	19	7
	E.	10	15	13	13	3	1	1	2	5	6	10	10	21	35	29	4
	N. E.	10	14	16	26	17	16	16	24	15	28	29	19	72	43	59	56
	Calm.	4	6	3	3	4	1	3	2	0	4	1	0	5	10	10	6
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knoxville, Tenn.	N.	7	10	5	7	10	17	11	18	12	20	25	7	57	24	22	46
	N. W.	5	11	15	14	13	11	12	13	18	9	10	13	37	29	42	38
	W.	4	3	3	5	3	3	2	5	7	1	7	8	15	15	11	10
	S. W.	26	15	15	18	11	12	9	6	6	6	8	12	20	53	44	27
	S.	7	10	13	14	15	26	14	19	21	24	16	20	61	37	42	59
	S. E.	2	5	8	4	7	9	3	1	10	13	7	12	30	19	19	13
	E.	3	5	0	7	1	2	3	1	4	2	4	1	10	9	8	6
	N. E.	20	21	6	7	9	2	4	7	6	12	8	8	26	49	28	13
	Calm.	19	13	25	17	21	11	35	14	9	3	8	9	20	41	63	60
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
La Crosse, Wis.	N.	15	13	21	9	16	26	14	19	21	19	12	16	52	44	46	59
	N. W.	9	9	10	14	18	11	3	7	12	9	3	12	24	30	42	21
	W.	4	4	5	13	10	17	13	10	13	4	4	14	21	22	28	40
	S. W.	11	3	3	15	2	6	19	12	9	4	11	12	24	26	20	37
	S.	36	49	27	28	40	16	32	27	22	21	40	20	83	105	95	75
	S. E.	6	9	4	6	0	1	7	2	7	6	11	5	24	20	10	10
	E.	1	2	5	1	1	3	0	0	0	7	3	2	10	5	7	3
	N. E.	6	2	10	4	2	1	0	5	7	20	6	2	33	11	16	6
	Calm.	5	2	5	3	1	12	5	2	2	0	3	6	5	13	9	19
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leavenworth, Kans.	N.	6	5	11	9	11	15	20	29	29	24	2	13	55	24	31	64
	N. W.	3	3	12	13	31	29	17	12	7	11	6	12	24	18	62	58
	W.	2	0	2	6	2	1	3	7	3	0	1	2	4	4	10	11
	S. W.	6	3	1	6	3	4	6	7	2	1	3	7	6	16	10	17
	S.	31	28	26	21	20	16	37	13	25	12	30	21	67	80	67	66
	S. E.	10	16	8	7	11	3	3	7	12	15	26	17	53	43	26	13
	E.	4	6	3	1	1	1	1	3	9	7	10	7	26	17	5	5
	N. E.	5	4	2	2	1	7	2	3	5	14	7	4	26	13	5	12
	Calm.	26	28	19	28	10	17	4	3	1	6	8	7	15	61	57	24
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Louisville, Ky.	N.	15	14	11	10	8	8	6	14	11	9	14	7	34	36	29	28
	N. W.	4	7	14	8	10	11	4	15	15	2	4	7	21	18	32	30
	W.	5	2	16	12	23	25	15	11	13	9	8	14	30	21	51	51
	S. W.	12	9	11	16	13	18	18	10	10	7	5	22	22	43	40	46
	S.	24	19	17	27	18	15	21	15	18	13	20	24	51	67	62	51
	S. E.	2	11	4	9	5	5	11	1	10	8	5	2	23	15	18	17
	E.	3	1	2	0	2	1	3	1	4	14	15	9	33	13	4	5
	N. E.	11	13	4	2	10	6	2	13	8	25	22	5	55	29	16	21
	Calm.	17	17	11	9	1	4	13	4	4	3	0	0	7	34	21	21
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lynchburg, Va.	N.	7	6	8	3	3	2	0	7	3	3	6	4	12	17	14	9
	N. W.	10	5	13	10	12	17	15	10	22	10	18	10	50	25	35	42
	W.	11	13	16	9	16	19	10	16	14	3	7	17	24	41	41	45
	S. W.	11	5	8	17	11	12	14	11	12	10	10	8	32	24	36	37
	S.	20	9	8	6	5	8	8	2	16	11	13	19	40	48	19	18
	S. E.	0	7	5	6	0	3	1	6	5	5	4	5	14	12	11	10
	E.	5	6	5	4	5	6	6	1	2	3	9	4	14	15	14	13
	N. E.	8	21	16	7	8	9	8	5	9	33	9	12	51	41	31	22
	Calm.	21	21	11	31	30	17	31	26	10	12	17	11	39	53	72	74
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malone, N. Y.	N.	5	11	12	1	8	5	2	2	12	6	....	....	....	....	21	9
	N. W.	19	17	11	20	13	15	6	5	11	17	....	....	....	....	44	26
	W.	21	14	7	19	14	23	21	25	25	7	....	....	....	....	40	69
	S. W.	27	15	18	30	16	24	27	25	16	8	....	....	....	....	64	76
	S.	14	18	17	11	9	4	9	11	14	7	....	....	....	....	37	24
	S. E.	3	5	6	7	3	5	6	3	4	24	....	....	....	....	16	14
	E.	0	2	5	1	3	0	0	2	1	6	....	....	....	....	9	2
	N. E.	0	11	12	3	16	5	3	3	5	13	....	....	....	....	31	11
	Calm.	4	0	2	1	8	12	19	8	3	2	....	....	....	....	11	39
	Blank.	0	0	0	0	0	0	0	0	0	0	....	....	....	....	0	0

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1876.	August.	September.	October.	November.	December.	January, '77	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Marquette, Mich....	N.	4	4	4	5	4	1	2	14	8	10	11	0	29	8	13	17
	N. W.	15	9	15	8	21	15	14	24	19	30	29	14	78	38	44	53
	W.	10	15	28	27	18	37	36	15	27	7	6	9	40	34	73	88
	S. W.	8	12	1	13	11	14	14	7	7	4	4	5	15	25	25	35
	S.	11	18	7	12	9	9	18	8	8	2	11	8	21	37	28	35
	S. E.	6	13	11	19	10	2	7	8	9	16	7	7	32	26	40	17
	E.	14	8	9	3	7	0	1	1	2	5	10	6	17	28	19	2
	N. E.	7	2	9	2	5	0	1	6	12	10	10	9	32	18	16	7
	Calm.	18	12	6	4	5	15	0	1	1	6	5	10	12	40	15	16
	Blank.	0	0	0	0	0	0	0	0	0	0	0	22	0	22	0	0
Memphis, Tenn.....	N.	13	7	18	11	9	10	12	18	8	7	2	0	17	20	38	40
	N. W.	12	7	19	10	20	12	11	15	13	16	10	6	39	25	49	38
	W.	4	5	8	5	10	15	3	5	7	5	7	5	19	14	23	23
	S. W.	20	8	10	11	9	13	7	8	12	13	10	29	35	57	30	28
	S.	17	13	7	14	11	9	23	8	17	9	11	17	37	47	32	40
	S. E.	11	13	0	6	5	1	8	1	11	14	29	8	54	32	11	10
	E.	3	8	2	1	6	1	2	1	1	5	4	5	8	16	9	4
	N. E.	7	17	6	8	9	17	10	17	20	11	16	8	47	32	23	44
	Calm.	6	15	20	27	11	15	17	11	4	10	6	12	20	33	58	43
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Milwaukee, Wis....	N.	8	6	5	3	6	11	4	14	18	13	7	3	38	17	14	29
	N. W.	2	7	21	22	28	28	19	10	16	11	0	8	27	17	71	57
	W.	17	9	6	22	19	29	35	16	11	5	5	12	21	36	47	80
	S. W.	12	16	8	19	12	14	26	14	15	4	4	17	23	45	39	54
	S.	6	8	2	1	7	1	0	4	2	6	3	5	11	19	10	5
	S. E.	21	28	16	16	8	1	3	4	7	16	22	17	45	66	40	8
	E.	10	7	9	6	0	3	1	3	8	5	16	15	29	32	15	7
	N. E.	16	8	19	4	10	3	4	12	13	30	26	13	69	37	33	19
	Calm.	1	4	4	0	0	3	1	7	3	0	0	0	3	5	4	11
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mobile, Ala.....	N.	3	13	27	31	36	47	35	50	23	20	19	13	62	29	94	132
	N. W.	9	9	4	4	8	9	12	1	11	9	6	2	26	20	16	22
	W.	8	5	1	1	3	3	1	2	1	4	0	3	5	16	5	6
	S. W.	5	8	8	2	4	1	1	1	7	4	2	12	13	25	14	3
	S.	40	32	24	32	16	10	31	15	27	25	38	41	90	113	72	56
	S. E.	16	15	5	4	5	0	3	3	15	18	15	10	48	41	14	6
	E.	8	6	0	4	2	5	3	1	1	4	6	6	11	20	6	9
	N. E.	1	4	17	10	6	15	1	4	2	2	5	3	9	8	33	20
	Calm.	3	1	4	5	10	3	6	7	6	4	2	0	12	4	19	16
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Montgomery, Ala...	N.	7	12	19	15	12	17	11	20	10	10	10	9	30	28	46	48
	N. W.	7	12	22	16	28	20	21	13	20	14	12	10	46	29	66	54
	W.	12	10	7	4	11	10	11	10	11	7	6	12	24	34	22	31
	S. W.	14	5	5	3	7	6	6	8	7	12	6	16	25	35	15	20
	S.	15	11	11	15	9	12	15	2	14	15	5	21	34	47	35	29
	S. E.	12	19	4	9	9	5	9	2	12	16	21	8	49	39	22	14
	E.	13	13	4	8	4	8	4	6	9	9	19	8	37	34	16	18
	N. E.	8	5	9	13	2	8	5	10	4	3	7	4	14	17	24	23
	Calm.	5	6	9	10	8	7	11	13	6	4	7	2	17	13	27	31
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Morgantown, W. Va.	N.	11	10	15	5	7	3	6	21	14	17	12	2	43	23	37	30
	N. W.	4	6	6	7	9	7	4	2	12	6	10	2	28	12	22	13
	W.	2	9	7	12	16	13	14	12	12	8	14	14	34	25	35	39
	S. W.	19	11	22	32	19	43	27	18	29	12	16	22	50	52	73	88
	S.	20	6	10	15	14	8	12	8	9	7	1	19	17	45	39	28
	S. E.	7	5	8	4	6	1	0	1	9	1	1	2	11	14	18	2
	E.	3	6	6	1	5	6	0	3	4	11	13	3	28	12	13	9
	N. E.	6	7	7	0	4	4	4	3	2	6	5	0	13	13	11	11
	Calm.	21	33	9	17	10	8	26	16	9	22	21	26	52	80	36	50
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mount Washington, N. H.	N.	8	4	3	5	9	4	4	7	3	20	12	5	35	17	17	15
	N. W.	69	63	44	72	40	62	76	69	56	20	59	50	135	182	156	207
	W.	4	3	5	10	9	6	7	0	10	3	1	19	14	26	24	13
	S. W.	5	3	7	3	4	5	2	0	5	6	1	2	12	10	14	7
	S.	0	0	1	3	0	0	1	0	4	5	0	3	9	3	4	1
	S. E.	0	10	9	0	11	2	0	9	6	10	0	2	16	12	20	2
	E.	0	2	8	0	8	4	0	1	4	6	0	3	10	5	16	5
	N. E.	5	7	8	0	3	6	2	5	4	12	19	1	35	13	11	13
	Calm.	2	1	5	0	6	4	1	2	1	8	1	5	10	8	11	7
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1876.	August.	September.	October.	November.	December.	January, '77.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Nashville, Tenn.....	N.	4	10	10	10	4	6	7	13	9	7	15	7	31	21	24	26
	N. W.	5	11	20	12	24	12	15	22	25	12	12	11	49	27	56	49
	W.	13	5	11	11	15	15	4	6	6	9	6	13	21	31	37	25
	S. W.	12	3	4	9	6	6	4	6	5	5	2	12	12	27	19	16
	S.	11	5	5	11	9	8	10	3	16	12	5	19	33	35	25	21
	S. E.	11	11	2	11	9	5	7	7	14	14	20	11	48	33	23	19
	E.	8	15	4	3	4	3	1	4	3	7	7	6	17	29	11	8
	N. E.	11	4	3	5	5	3	2	11	7	10	9	3	26	18	13	16
	Calm.	18	29	31	21	14	35	43	12	8	14	17	8	39	55	66	90
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New Haven, Conn..	N.	15	12	13	10	24	24	14	17	14	12	18	13	44	40	47	55
	N. W.	12	13	10	23	21	25	17	23	18	11	15	5	44	30	54	65
	W.	5	2	11	16	5	12	7	4	7	1	4	5	12	12	32	23
	S. W.	27	10	11	21	4	13	20	16	15	1	23	22	39	59	36	49
	S.	19	25	15	7	5	2	5	4	6	14	12	28	32	72	27	11
	S. E.	2	8	4	6	1	0	0	0	3	13	4	5	20	15	11	0
	E.	1	4	5	2	2	0	0	0	7	3	3	3	13	8	9	0
	N. E.	9	11	21	2	24	14	15	7	21	30	8	7	59	27	47	36
	Calm.	3	8	0	6	4	3	15	13	2	5	6	2	13	13	10	31
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New London, Conn..	N.	10	11	20	6	19	14	13	12	14	19	14	5	47	26	45	39
	N. W.	12	17	12	19	19	31	23	25	20	15	15	7	50	36	50	79
	W.	18	9	16	24	7	21	21	10	12	6	11	5	29	32	47	52
	S. W.	21	9	8	19	5	6	13	14	16	4	19	28	39	58	32	33
	S.	12	14	9	0	1	2	2	3	4	4	2	7	10	33	10	7
	S. E.	3	7	7	4	2	1	1	3	8	12	11	21	31	31	13	5
	E.	2	9	4	2	3	2	3	1	4	12	4	3	20	14	9	6
	N. E.	1	5	12	2	14	8	5	4	8	12	6	4	26	10	28	17
	Calm.	14	12	2	17	20	8	12	12	7	6	11	10	24	36	39	32
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New Orleans, La....	N.	6	7	22	18	22	28	25	31	15	12	12	3	39	16	62	84
	N. W.	6	3	12	8	16	15	7	8	8	11	4	5	23	14	36	30
	W.	13	9	8	4	1	2	3	7	6	7	7	10	20	32	13	12
	S. W.	6	9	9	2	4	3	5	4	11	7	7	19	25	34	15	82
	S.	9	11	6	10	7	4	13	1	16	13	5	21	34	41	23	18
	S. E.	32	30	10	25	9	2	11	5	21	27	24	18	72	80	44	18
	E.	5	13	5	9	7	11	10	8	7	9	28	8	44	26	21	29
	N. E.	7	7	12	12	15	19	14	14	5	3	6	6	14	20	39	47
	Calm.	9	4	6	5	9	9	5	6	4	1	0	0	5	13	20	20
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Newport, R. I.....	N.	8	7	16	4	27	19	10	4	10	21	10	2	41	17	47	33
	N. W.	7	7	5	14	15	24	8	27	17	14	12	6	43	20	34	59
	W.	8	8	9	27	15	22	31	12	13	5	7	6	25	22	51	65
	S. W.	37	20	17	27	6	17	23	26	12	7	35	34	54	91	50	66
	S.	11	13	9	5	3	2	5	3	5	6	3	15	14	39	17	10
	S. E.	6	13	13	3	2	4	3	1	14	11	10	9	35	28	18	8
	E.	3	4	3	5	3	1	4	0	9	10	5	8	24	15	11	5
	N. E.	3	7	13	2	18	3	5	5	7	15	6	2	28	12	33	13
	Calm.	10	14	5	6	1	1	4	6	6	1	5	8	12	32	12	11
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New York, N. Y	N.	1	5	4	8	11	6	8	7	8	5	4	1	17	7	23	21
	N. W.	22	19	18	26	23	38	26	35	24	22	31	12	77	53	67	99
	W.	11	5	8	20	16	19	25	10	16	8	15	13	39	29	44	54
	S. W.	20	15	13	16	9	7	11	16	11	4	14	21	29	56	38	34
	S.	16	12	5	7	4	1	2	2	8	4	13	19	25	47	16	5
	S. E.	6	13	11	2	2	0	3	0	7	12	5	12	24	31	15	3
	E.	3	7	4	0	6	2	1	5	4	2	2	3	15	13	10	8
	N. E.	14	17	25	11	16	11	11	7	15	26	9	9	50	40	52	29
	Calm.	0	0	2	3	3	9	6	2	0	0	0	0	0	0	8	17
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Norfolk, Va.....	N.	7	8	11	25	24	17	13	17	13	8	19	8	40	18	60	47
	N. W.	8	5	7	6	9	21	8	12	15	5	6	1	26	14	22	41
	W.	3	3	8	2	5	6	7	4	4	4	4	4	12	10	15	17
	S. W.	28	15	11	19	14	18	18	17	11	15	20	21	46	64	44	53
	S.	19	17	11	8	11	7	11	3	18	16	2	25	36	61	30	21
	S. E.	12	24	12	6	3	2	7	7	11	7	16	10	34	46	21	16
	E.	7	9	9	7	1	2	8	5	10	8	9	8	27	24	17	15
	N. E.	9	14	20	14	18	19	20	17	9	26	16	12	51	35	52	56
	Calm.	0	3	1	6	5	1	1	2	2	1	1	1	4	4	12	4
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1876.	August.	September.	October.	November.	December.	January, '77.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
North Platte, Nebr..	N.	9	4	11	11	16	9	5	5	7	12	0	15	19	28	38	19
	N. W.	5	4	13	15	28	18	17	12	9	14	13	10	36	19	56	47
	W.	4	2	8	24	24	32	52	26	25	12	8	14	45	20	56	110
	S. W.	0	4	1	1	6	5	3	3	3	0	7	2	10	6	8	11
	S.	17	11	5	7	1	2	3	5	6	10	4	18	20	46	13	10
	S. E.	24	40	20	10	4	5	2	8	6	4	33	10	43	74	34	15
	E.	16	15	12	6	2	4	2	16	26	20	20	12	66	43	20	22
	N. E.	14	9	10	14	2	11	5	6	11	13	7	7	31	30	26	22
	Calm.	4	4	10	5	7	7	4	3	0	5	1	2	6	10	22	14
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Omaha, Nebr	N.	11	12	20	11	13	19	19	24	32	22	9	20	69	43	44	62
	N. W.	8	4	19	19	30	22	15	15	13	17	3	9	33	21	68	52
	W.	2	0	0	8	2	7	7	4	2	1	6	14	9	16	10	18
	S. W.	5	2	3	7	0	8	14	9	7	1	3	3	11	10	10	31
	S.	28	34	11	16	23	10	24	18	16	8	22	15	46	77	52	52
	S. E.	16	23	10	8	6	5	5	4	14	20	27	19	61	58	24	14
	E.	9	2	8	0	0	6	2	2	3	4	18	4	25	15	8	10
	N. E.	6	2	3	0	0	5	0	3	5	10	4	3	19	11	3	8
	Calm.	8	14	16	22	16	11	7	5	1	1	1	3	3	25	54	23
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oswego, N. Y	N.	1	8	8	2	6	3	6	9	8	10	18	6	36	15	16	18
	N. W.	11	17	12	15	14	27	19	13	17	18	17	11	52	39	41	59
	W.	28	18	14	20	12	7	6	15	12	25	31	25	68	71	46	28
	S. W.	23	3	9	17	6	13	13	10	15	2	12	8	29	34	32	36
	S.	8	13	8	12	8	10	8	10	5	3	4	16	12	37	28	28
	S. E.	15	21	23	23	25	26	30	15	26	20	5	14	51	50	71	71
	E.	0	4	6	0	6	3	3	0	2	5	0	1	7	5	12	6
	N. E.	2	3	4	3	10	2	0	4	4	4	3	8	11	13	17	6
	Calm.	5	6	6	1	3	2	8	8	4	3	3	1	10	12	10	18
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pembina, Dak	N.	3	9	11	14	22	9	0	8	16	14	12	9	42	21	47	17
	N. W.	17	14	24	22	26	19	31	16	24	23	11	23	58	54	72	66
	W.	9	8	12	10	3	12	14	7	22	2	2	8	26	25	25	33
	S. W.	5	1	4	7	2	0	9	2	0	0	5	5	5	11	13	11
	S.	24	17	18	17	16	26	22	28	10	15	20	6	45	47	51	76
	S. E.	13	23	5	13	5	13	7	6	13	8	30	22	51	58	23	26
	E.	2	2	7	3	1	1	0	1	2	9	6	3	17	7	11	2
	N. E.	3	0	6	2	2	3	0	0	1	8	5	2	14	5	10	3
	Calm.	17	19	3	5	13	10	10	16	5	11	2	12	18	48	21	36
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Philadelphia, Pa	N.	14	5	12	14	22	24	17	24	21	13	23	6	57	25	48	65
	N. W.	16	13	12	19	16	24	16	17	17	9	11	7	37	36	47	57
	W.	21	17	13	22	12	16	25	20	6	9	20	24	35	62	47	61
	S. W.	18	8	10	14	6	4	5	3	19	7	12	25	38	51	30	12
	S.	2	10	4	2	5	1	1	0	2	3	3	6	8	18	11	2
	S. E.	3	6	4	1	1	1	2	1	2	6	3	4	11	13	6	4
	E.	15	21	29	17	17	20	17	11	20	30	13	13	63	49	63	48
	N. E.	3	8	6	4	11	3	9	8	6	13	8	4	27	15	21	20
	Calm.	1	5	0	0	0	0	1	0	0	0	0	1	0	7	0	1
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pike's Peak, Colo	N.	9	3	9	4	9	18	15	10	9	15	6	3	30	15	22	43
	N. W.	14	4	11	27	27	37	15	7	29	12	10	14	51	32	65	59
	W.	19	34	44	24	33	23	27	13	36	13	29	22	78	75	101	63
	S. W.	26	37	17	23	7	4	29	18	15	31	39	46	85	109	47	51
	S.	3	4	3	0	0	0	0	10	2	5	3	2	10	9	3	10
	S. E.	1	2	1	1	0	0	0	4	0	5	2	0	7	3	2	4
	E.	4	1	0	4	1	0	0	4	1	1	1	0	3	5	5	4
	N. E.	16	8	4	8	11	8	3	16	0	7	1	2	8	26	23	27
	Calm.	1	0	1	2	2	3	4	2	1	1	2	1	4	2	5	9
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pittsburgh, Pa	N.	6	11	7	13	5	7	5	16	11	13	18	5	42	22	25	28
	N. W.	13	18	23	16	17	15	15	25	27	22	24	9	73	40	56	55
	W.	12	8	8	20	23	30	25	11	17	9	15	18	41	38	51	66
	S. W.	26	11	11	19	11	17	18	9	10	5	7	26	22	63	41	44
	S.	13	11	3	6	10	5	9	3	7	4	2	12	13	36	19	17
	S. E.	1	8	7	3	6	2	5	1	5	8	4	4	17	13	16	8
	E.	8	9	12	7	8	10	11	7	11	18	11	4	40	21	27	28
	N. E.	8	11	15	3	7	7	4	8	4	9	8	8	21	27	25	19
	Calm.	6	6	4	6	3	0	1	4	1	2	4	4	7	16	13	5
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1876.	August.	September.	October.	November.	December.	January, '77.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Port Huron, Mich ...	N.	18	3	8	1	3	5	4	17	21	28	19	15	68	36	12	26
	N. W.	4	6	18	14	13	19	7	10	9	3	1	3	13	13	45	36
	W.	4	4	6	18	21	20	10	9	8	5	5	6	18	14	45	39
	S. W.	17	10	10	24	15	22	19	14	11	6	9	8	26	35	49	55
	S.	19	26	4	15	7	11	31	16	19	8	19	32	46	77	26	58
	S. E.	2	11	6	10	11	3	1	2	5	5	1	4	11	17	27	6
	E.	3	2	12	6	6	3	2	2	1	2	1	1	4	6	24	7
	N. E.	19	24	23	5	8	8	5	6	16	28	32	15	76	58	36	19
	Calm.	7	7	3	0	6	2	14	8	3	5	6	6	14	20	9	24
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portland, Me.....	N.	3	4	9	8	19	20	13	4	13	15	12	5	40	12	36	37
	N. W.	11	14	7	10	17	15	12	23	13	12	9	8	34	33	34	50
	W.	11	8	5	33	12	29	25	10	14	4	16	12	34	31	50	64
	S. W.	11	11	12	10	2	8	12	11	15	7	14	19	36	41	24	31
	S.	18	12	12	8	2	4	5	4	8	5	12	20	25	50	22	13
	S. E.	6	13	8	2	2	1	0	3	10	13	8	8	31	27	12	4
	E.	4	2	5	2	3	0	1	2	3	7	4	7	14	13	10	3
	N. E.	8	2	13	0	18	3	5	9	11	20	15	5	46	15	31	17
	Calm.	21	27	19	20	15	13	20	18	6	7	3	6	16	54	54	51
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portland, Oreg	N.	30	31	16	18	7	30	16	12	12	25	22	29	59	90	41	58
	N. W.	6	7	11	9	7	15	9	11	4	14	14	21	32	34	27	35
	W.	2	1	2	1	2	0	4	1	3	3	3	3	9	6	5	5
	S. W.	1	4	3	9	8	12	6	4	12	8	6	6	26	11	20	22
	S.	27	11	15	32	28	11	19	22	24	16	20	16	60	54	75	58
	S. E.	0	0	3	1	9	13	14	8	8	3	2	3	13	3	13	35
	E.	1	3	4	0	5	2	16	7	6	2	2	2	10	6	9	25
	N. E.	0	0	2	2	4	3	4	2	2	3	4	4	9	4	8	9
	Calm.	26	36	34	21	20	7	5	17	22	16	20	6	58	68	75	29
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Punta Rassa	N.	0	8	12	11	15	17	8	14	7	8	10	5	25	13	38	39
	N. W.	3	5	9	12	17	22	11	16	17	10	8	6	35	14	38	49
	W.	9	11	11	5	5	4	3	4	9	7	15	19	31	39	21	11
	S. W.	15	9	13	4	6	1	3	9	11	16	6	8	33	32	23	13
	S.	10	10	3	7	5	12	17	5	8	13	7	7	28	27	15	34
	S. E.	13	4	7	10	6	12	7	4	10	11	6	2	27	19	23	23
	E.	24	20	12	7	8	6	17	8	12	14	21	19	47	63	27	31
	N. E.	18	24	22	37	27	17	25	20	17	10	19	11	46	53	86	62
	Calm.	1	2	1	0	1	2	2	3	2	1	0	3	3	6	2	7
	Blank.	0	0	0	0	0	0	0	1	0	0	1	10	1	10	0	1
Rochester, N. Y	N.	10	12	5	0	3	2	2	4	1	7	9	5	17	27	8	8
	N. W.	10	9	10	9	8	13	9	16	19	19	25	10	63	29	27	38
	W.	35	15	23	39	32	35	38	34	36	18	29	30	83	80	94	107
	S. W.	14	20	10	14	10	15	28	17	7	1	5	19	13	53	34	54
	S.	9	10	3	11	9	2	7	2	7	6	1	4	14	23	23	11
	S. E.	7	6	13	15	13	11	8	3	13	8	3	4	24	17	41	22
	E.	3	13	16	4	9	4	5	2	5	19	4	11	28	27	29	11
	N. E.	3	4	10	0	6	1	2	5	5	12	16	6	33	13	16	8
	Calm.	2	4	0	1	0	10	0	1	0	0	1	1	1	7	1	11
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salt Lake City, Utah.	N.	15	15	6	6	5	4	1	1	10	14	11	14	35	44	17	6
	N. W.	19	19	38	21	34	22	18	27	22	25	27	26	74	64	93	67
	W.	7	5	3	4	7	15	3	21	6	3	9	3	18	15	14	39
	S. W.	2	0	2	2	4	3	5	4	4	3	3	3	10	5	8	12
	S.	5	10	6	10	7	5	10	4	8	5	6	2	19	17	23	19
	S. E.	17	21	15	12	5	7	36	9	20	13	15	17	48	55	32	52
	E.	6	8	9	14	5	7	8	8	12	16	12	9	40	23	28	23
	N. E.	6	7	3	7	5	4	10	2	9	9	4	12	22	25	15	16
	Calm.	16	8	8	17	18	26	2	8	2	2	6	4	10	28	43	36
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Diego, Cal	N.	13	7	15	8	7	10	11	9	7	5	2	8	14	28	30	30
	N. W.	13	26	31	22	22	24	18	22	16	21	9	21	46	60	75	64
	W.	32	21	16	15	3	4	8	7	27	26	31	19	84	72	34	19
	S. W.	5	18	10	8	6	2	3	2	10	11	23	13	44	36	24	7
	S.	14	11	8	7	2	5	7	8	9	10	18	19	37	44	17	20
	S. E.	2	0	0	4	2	0	7	6	3	5	7	2	15	4	6	13
	E.	0	0	2	6	4	6	3	3	5	2	2	1	9	1	12	12
	N. E.	1	0	1	11	16	20	13	13	2	1	0	2	3	3	28	46
	Calm.	13	10	7	12	28	22	23	14	14	9	1	5	24	28	47	59
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1876.	August.	September.	October.	November.	December.	January, '77.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Sandy Hook, N. J.	N.	4	7	2	10	14	15	8	10	12	9	10	3	31	14	26	33
	N. W.	8	9	18	18	17	23	18	31	27	14	23	8	64	2[illegible]	53	72
	W.	14	8	11	18	15	17	27	15	8	5	15	19	28	34	44	59
	S. W.	18	7	6	16	2	13	13	9	5	6	11	11	22	36	24	35
	S.	12	11	8	9	2	2	3	3	9	1	8	16	18	39	19	7
	S. E.	19	23	15	7	8	0	3	3	12	25	13	25	50	67	30	6
	E.	2	8	6	0	0	1	0	4	5	8	0	5	13	15	6	5
	N. E.	15	12	21	10	28	16	14	7	13	18	11	6	42	33	59	37
	Calm.	1	8	3	5	4	6	8	2	2	4	2	4	8	13	12	16
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Francisco, Cal.	N.	0	0	0	3	22	29	26	17	5	1	3	0	9	0	25	72
	N. W.	0	1	1	8	22	24	15	16	3	7	3	5	13	6	31	55
	W.	38	31	23	28	13	11	8	22	48	52	57	41	157	110	64	47
	S. W.	48	52	45	34	4	4	9	7	14	17	24	33	55	133	83	20
	S.	2	2	4	3	4	1	4	5	4	5	6	5	15	9	11	10
	S. E.	2	1	2	9	1	0	14	5	5	2	0	2	7	5	12	19
	E.	1	2	0	0	2	3	3	2	1	0	0	0	1	3	2	8
	N. E.	0	0	0	0	4	4	6	0	2	0	0	0	2	0	4	10
	Calm.	2	4	15	8	18	17	8	4	11	6	0	4	17	10	41	29
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santa Fé, N. Mex.	N.	5	12	10	16	30	25	22	15	15	9	10	7	34	24	56	62
	N. W.	7	6	6	8	10	15	12	15	12	13	3	5	28	18	24	42
	W.	3	3	5	11	8	3	6	5	12	9	7	7	28	13	24	14
	S. W.	13	14	10	11	5	8	9	3	16	9	27	22	52	55	26	20
	S	12	8	9	8	3	9	10	8	2	7	5	3	14	23	20	27
	S. E.	14	16	12	15	10	4	14	7	8	17	18	26	43	56	37	25
	E.	26	15	20	17	5	17	12	17	14	18	16	13	48	54	42	46
	N. E.	10	10	10	5	14	7	7	8	9	3	5	1	17	21	29	22
	Calm.	3	9	8	2	5	5	1	6	1	5	2	0	8	12	15	12
	Blank.	0	0	0	0	0	0	0	0	4	0	0	0	4	0	0	0
Savannah, Ga.	N.	3	4	5	10	12	19	4	14	9	11	6	2	26	9	27	37
	N. W.	3	3	12	12	10	23	17	12	14	8	12	7	34	13	34	52
	W.	5	6	12	12	28	9	9	8	15	10	2	12	27	23	52	26
	S. W.	35	13	13	13	10	16	25	14	19	27	9	23	55	71	36	55
	S.	9	12	9	5	2	1	4	1	9	12	9	19	30	40	16	6
	S. E.	8	13	7	1	0	4	13	10	9	4	15	7	28	28	8	27
	E.	3	3	2	9	8	6	7	5	5	7	23	12	35	18	19	18
	N. E.	13	6	8	20	13	12	6	20	5	7	12	2	24	21	41	38
	Calm.	14	33	22	8	7	3	8	0	8	4	5	6	17	53	37	11
	Blank.	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3	0
Shreveport, La.	N.	14	8	13	9	17	17	11	20	10	7	4	3	21	25	39	48
	N. W.	4	3	7	5	17	11	9	7	6	12	5	2	23	9	29	27
	W.	5	7	2	4	3	11	6	8	5	10	5	0	20	12	9	25
	S. W.	10	7	3	2	1	0	3	3	3	6	0	7	9	24	6	6
	S.	15	8	14	26	15	15	15	8	31	14	24	39	69	62	55	38
	S. E.	19	24	11	7	10	7	10	3	11	11	28	9	50	52	28	20
	E.	8	19	12	4	9	8	1	7	8	13	7	6	28	33	25	16
	N. E.	9	8	8	15	5	9	4	11	4	4	2	1	10	18	23	24
	Calm.	9	9	20	21	13	15	34	17	15	13	18	23	46	41	54	66
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Smithville, N. C.	N.	9	7	18	27	22	24	13	18	18	14	21	6	53	22	67	55
	N. W.	1	7	5	11	14	17	10	11	6	3	6	1	15	9	30	34
	W.	2	5	10	6	18	15	9	12	13	4	4	8	21	15	34	36
	S. W.	49	21	25	16	10	15	26	12	20	26	13	23	59	93	51	53
	S.	13	20	9	1	5	1	3	0	10	13	14	23	37	56	15	4
	S. E.	4	11	8	7	2	2	4	2	3	6	7	5	16	20	17	8
	E.	12	10	8	5	4	2	7	7	8	11	17	14	36	36	17	16
	N. E.	3	5	4	17	9	15	16	19	8	11	8	3	27	11	30	50
	Calm.	0	7	3	3	6	2	5	3	7	2	3	7	12	14	12	10
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springfield, Mass.	N.	10	9	14	1	20	23	12	11	18	27	16	11	61	30	35	46
	N. W.	13	7	10	19	16	21	13	21	22	14	16	8	52	28	45	55
	W.	11	3	4	17	7	13	16	8	10	2	6	9	18	23	28	37
	S. W.	16	12	3	10	2	7	2	3	7	3	6	6	16	34	15	12
	S.	19	35	19	16	7	10	20	20	11	10	21	40	42	94	42	50
	S. E.	1	1	7	1	2	0	0	0	3	2	1	1	6	3	10	0
	E.	6	3	3	1	2	0	0	0	0	8	0	0	8	9	6	0
	N. E.	6	2	15	4	13	3	0	5	10	16	11	4	37	12	32	8
	Calm.	11	16	15	24	21	16	30	16	12	8	16	11	36	38	60	62
	Blank.	0	5	0	0	0	0	0	0	0	0	0	0	0	5	0	0

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1876.	August.	September.	October.	November.	December.	January, '77.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Saint Louis, Mo	N.	7	6	20	9	17	22	15	20	20	17	12	11	59	24	46	57
	N. W.	5	4	13	11	19	17	17	10	6	4	2	6	12	15	43	44
	W.	8	8	3	10	2	8	10	4	5	10	5	6	20	22	15	22
	S. W.	17	10	16	20	19	14	16	12	5	7	3	10	15	37	64	42
	S.	26	36	19	17	13	7	26	9	16	10	21	34	47	96	49	42
	S. E.	7	9	1	3	6	5	3	1	4	10	20	14	34	30	10	9
	E.	10	11	5	4	3	2	0	7	8	15	14	3	37	24	12	9
	N. E.	12	8	9	10	10	18	6	21	19	17	13	6	49	26	29	45
	Calm.	1	1	4	0	1	0	0	0	0	0	2	0	2	2	5	0
	Blank.	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
Saint Mark's, Fla.	N.	8	7	12	22	18	36	19	32	18	10	14	6	42	21	52	87
	N. W.	6	6	10	12	16	12	7	4	11	11	9	6	31	18	38	23
	W.	3	10	15	2	7	3	4	8	5	5	8	10	18	23	24	15
	S. W.	7	5	13	3	8	5	6	0	3	12	4	9	19	21	24	11
	S.	22	19	9	6	16	11	24	14	21	28	12	26	61	67	31	49
	S. E.	10	9	4	2	2	4	8	2	11	6	10	8	27	27	8	14
	E.	6	2	7	6	3	3	3	1	2	3	19	6	24	20	16	7
	N. E.	4	9	4	24	3	10	5	13	0	2	10	2	12	15	31	28
	Calm.	27	20	16	16	17	9	17	10	22	13	7	17	42	64	49	36
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Saint Paul, Minn	N.	13	3	15	3	4	8	7	18	7	18	9	10	34	26	22	33
	N. W.	11	11	22	20	34	26	8	12	24	11	5	17	40	39	76	46
	W.	2	9	6	17	7	15	12	13	12	5	1	10	18	21	30	40
	S. W.	7	2	0	5	2	10	28	12	11	6	5	9	22	18	7	50
	S.	11	16	11	9	1	5	7	7	6	5	9	9	20	36	21	19
	S. E.	23	35	12	15	30	14	18	17	17	15	42	20	74	78	57	49
	E.	2	7	7	8	0	4	4	1	3	10	5	6	18	15	15	9
	N. E.	5	2	9	5	1	3	2	1	3	13	10	4	26	11	15	6
	Calm	11	8	8	11	9	8	7	3	10	7	7	5	24	24	28	18
	Blank.	8	0	0	0	2	0	0	0	0	0	0	0	0	8	2	0
Thatcher's Island, Mass.	N.	9	5	9	4	13	7	10	7	10	23	14	2	47	16	26	24
	N. W.	11	15	11	15	26	38	26	34	21	9	14	15	44	41	52	98
	W.	6	7	5	32	9	26	26	7	13	4	6	4	23	17	46	59
	S. W.	32	25	14	22	3	9	17	18	8	3	21	26	32	83	39	44
	S.	13	14	15	10	3	1	5	5	17	10	10	26	37	53	28	11
	S. E.	7	10	6	3	6	2	2	1	7	9	7	4	23	21	15	5
	E.	3	7	9	3	11	3	1	1	9	8	7	2	24	12	23	5
	N. E.	11	7	19	2	17	7	3	9	7	21	11	9	39	27	38	19
	Calm.	1	3	2	2	2	0	3	2	1	3	3	2	7	6	6	5
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Toledo, Ohio	N.	5	8	15	2	5	4	1	7	6	5	8	3	19	16	22	12
	N. W.	8	5	11	5	6	11	3	6	6	0	5	1	11	14	22	20
	W.	7	8	11	18	17	7	10	15	18	13	7	14	38	29	46	32
	S. W.	28	22	13	28	24	36	36	24	19	6	13	19	38	69	65	96
	S.	7	11	5	18	11	6	18	5	9	4	12	19	25	37	34	29
	S. E.	1	5	3	1	3	5	3	0	1	1	2	8	4	14	7	8
	E.	6	14	6	15	3	6	5	4	3	5	10	7	18	27	24	15
	N. E.	12	9	21	0	10	8	6	12	17	46	30	9	93	30	31	26
	Calm.	19	11	5	6	11	9	11	10	14	10	6	10	30	40	22	30
	Blank.	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2
Tybee Island, Ga.	N.	4	3	4	14	10	11	6	15	5	4	1	3	10	10	28	32
	N. W.	5	6	15	11	8	13	12	13	17	15	12	9	44	20	34	38
	W.	4	1	11	12	18	5	8	8	9	7	4	9	20	14	41	21
	S. W.	7	1	8	4	5	6	14	11	7	1	1	7	9	15	17	31
	S.	44	33	24	12	5	5	22	5	22	37	16	31	75	108	41	32
	S. E.	4	12	7	4	0	1	8	3	15	12	6	16	33	32	11	12
	E.	9	15	9	10	7	5	10	10	12	7	29	8	48	32	26	25
	N. E.	7	4	9	22	10	14	12	17	4	7	22	7	33	18	41	43
	Calm.	9	18	3	4	6	2	1	2	2	0	2	0	4	27	13	5
	Blank.	0	0	0	0	21	31	0	0	0	0	0	0	0	0	21	31
Vicksburg, Miss.	N.	10	8	21	12	17	18	15	11	13	9	8	5	30	23	50	44
	N. W.	6	4	5	5	12	8	3	7	2	9	7	1	18	11	22	18
	W.	11	8	6	8	5	5	5	2	6	4	8	5	18	24	19	12
	S. W.	11	2	2	6	10	11	12	6	12	6	6	22	24	35	18	29
	S.	17	12	6	11	9	6	11	5	19	19	19	23	57	51	26	22
	S. E.	15	31	4	13	14	7	11	3	19	15	24	15	58	61	31	21
	E.	4	0	2	2	3	10	2	8	5	12	8	5	25	9	7	20
	N. E.	7	3	9	11	13	15	10	15	8	5	6	4	19	14	33	40
	Calm.	12	25	35	25	10	13	24	27	9	11	7	11	27	48	70	64
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Statement showing how many times the wind was observed blowing, &c.—Continued.

Station.	Wind.	July, 1876.	August.	September.	October.	November.	December.	January, '77.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
Virginia City, Mont.	N.	1	2	0	0	2	0	1	2	0	1	0	1	1	4	2	3
	N. W.	11	5	4	4	3	1	1	3	3	2	8	4	13	20	11	5
	W.	11	14	12	14	10	8	3	2	5	12	10	16	27	41	36	13
	S. W.	9	8	7	16	26	13	17	5	29	9	8	17	46	34	49	35
	S.	9	5	4	1	0	2	0	2	0	2	0	5	2	19	5	4
	S. E.	10	12	15	9	8	8	9	15	8	15	17	12	40	34	32	32
	E.	6	8	5	8	0	2	5	2	12	4	8	5	24	19	13	9
	N. E.	9	6	5	2	0	3	8	4	5	18	20	6	43	21	7	15
	Calm.	27	33	38	39	41	56	49	49	31	27	22	24	80	84	118	154
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Washington, D. C ...	N.	20	9	11	11	20	16	13	14	17	13	11	5	41	34	42	43
	N. W.	16	12	17	24	23	35	17	24	25	16	28	9	69	37	64	76
	W.	8	10	7	6	6	5	9	9	3	5	5	7	13	25	19	23
	S. W.	14	7	9	13	7	7	13	5	6	4	5	12	15	43	29	25
	S.	16	17	8	16	9	11	10	11	21	10	29	36	60	69	33	32
	S. E.	4	5	3	5	4	5	3	6	5	5	6	5	16	14	12	14
	E.	3	7	11	2	2	6	12	0	8	13	4	5	25	15	15	18
	N. E.	7	22	16	9	14	7	11	11	4	22	5	7	31	36	39	29
	Calm.	5	4	8	7	5	1	5	4	4	2	0	4	6	13	20	10
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wilmington, N. C ...	N.	4	2	9	13	15	13	13	11	8	14	10	2	32	8	37	37
	N. W.	0	4	2	14	15	26	11	16	16	4	17	2	37	6	38	53
	W.	6	13	13	9	12	11	10	9	7	3	1	9	11	28	34	30
	S. W.	36	10	15	13	13	20	26	13	23	27	13	33	63	79	41	59
	S.	18	20	8	4	9	2	4	2	11	15	8	13	34	51	21	8
	S. E.	6	13	12	5	3	1	7	5	12	7	16	16	35	35	20	13
	E.	13	12	9	7	2	2	10	3	9	11	13	3	33	28	18	15
	N. E.	8	12	11	23	17	15	10	23	2	8	12	9	22	29	51	48
	Calm.	2	7	4	5	4	3	2	2	5	1	3	3	9	12	13	7
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wood's Holl, Mass...	N.	4	3	6	6	21	10	9	12	13	19	16	3	48	10	33	31
	N. W.	7	20	11	37	27	58	42	30	21	16	17	11	54	38	75	130
	W.	4	2	7	7	1	3	5	10	10	3	8	7	21	13	15	18
	S. W.	41	12	18	23	9	8	15	15	9	7	25	32	41	85	50	38
	S.	14	20	12	8	2	1	3	8	11	4	6	18	21	52	22	12
	S. E.	7	11	4	2	12	1	6	1	11	9	10	9	30	27	18	8
	E.	2	3	10	7	7	4	3	2	8	11	4	5	23	10	24	9
	N. E.	7	12	20	2	11	8	6	5	10	18	6	3	34	22	33	19
	Calm.	7	10	2	1	0	0	4	1	0	3	1	2	4	19	3	5
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yankton, Dak.....	N.	4	6	5	7	3	4	6	11	19	12	3	8	34	18	15	21
	N. W.	7	9	31	28	42	32	29	19	12	18	9	19	32	35	101	80
	W.	2	7	6	9	4	11	14	6	8	4	7	10	19	19	19	31
	S. W.	5	4	2	14	5	8	17	19	7	4	8	7	29	16	21	44
	S.	31	24	9	11	3	3	9	9	2	2	8	8	12	63	23	21
	S. E.	21	25	13	9	14	10	7	8	17	19	34	22	70	68	36	25
	E.	7	10	15	6	5	7	4	3	14	11	21	5	46	22	26	14
	N. E.	7	5	6	2	6	14	4	8	12	14	1	6	27	18	14	26
	Calm.	9	3	3	7	8	4	3	1	2	6	2	5	10	17	18	8
	Blank.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PAPER 21.

Extracts from the Instructions to Observer Sergeants.

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6. The regular observations from will commence with the morning-observation of , and on and after that date seven observations will be made daily, three of which will form the *telegraphic* series, three the *local*, and one the *midday* series.

7. The observations forming the telegraphic series will be taken daily at a. m., p. m., and m. (local time), and, after the proper corrections have been made, will be written on Form 5, if the station is a telegraphic one, and also in the Daily Record of Observations and the Record of Bulletins (where this is authorized). At stations that do not report by telegraph, Form 5 will not be used.

8. The instruments will be read in the following order:

1. Barometer.
2. Thermometer.
3. Hygrometer.
4. Anemometer.
5. Anemoscope.
6. Rain-gauge.

9. The readings of the different instruments must be entered in the original record of observations as soon as made, and *not* copied in afterward from a slip of paper. Observers will habitually carry this book when making an observation, and enter the reading in *pencil*, as noted at the time. They will also enter in this book the proper corrections, as indicated by the marginal references. Pen and ink must *not* be used for entering any observation or correction in this record.

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13. In addition to the telegraphic series of observations, three others, forming the local series, will be taken daily at 7 a. m., 2 p. m., and 9 p. m. (local time), respectively. These observations will be entered in the daily record in the same manner as the telegraphic observations, but on a separate sheet.

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15. The midday series will consist of an observation taken daily at 12 m., Washington mean time, and will be entered in the daily record as a separate series. When this report is called for by telegraph from the central office, the *corrected* barometric reading, the direction of wind and state of weather, and the velocity of the wind in miles per hour will be given; the whole being sent in the same order in which they are here named, and in the regular cipher-word.

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29. At all stations ordered to make river-reports, the depth of water will be observed at three o'clock (local time) each afternoon, and embodied in the regular p. m. telegraphic report.

30. Whenever any sudden or unusual change occurs in the condition of the river, a special series of observations will be reported in the usual manner at the next succeeding telegraphic report. These special reports will be continued tri-daily (one at each telegraphic report) until the river resumes its normal condition, when they will be discontinued.

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32. The observations for the morning and midnight special river-reports will be made, if practicable, within an hour of the time of report.

Observers must exercise great care in making and recording the river-observations, in order that they may be relied upon as accurate by interested parties.

33. The amount of rain-fall (or melted snow) will be measured and reported at each of the three telegraphic reports only.

MAXIMUM THERMOMETER.

This instrument will be read daily at the time of making the 11 p. m. observation.

The minimum thermometer will be read at the 7.35 a. m. and 11 p. m. observations. At the 7.35 a. m. observation, care must be taken not to disturb the index, which will be set at the time of taking the night-observation only. The minimum temperature at the time of making the 7.35 a. m. observation will form a part of the regular telegraphic report from all stations.

34. At stations provided with this thermometer one observation will be made at three o'clock p. m. (local time), daily, of the temperature of the water at the surface and bottom of the lake, bay or river upon which the station is located.

The observer will select some convenient spot on the shore (a wharf or pier when practicable), where a sufficient depth of water exists to give a positive difference be-

tween the surface and bottom temperatures, and will provide himself with enough strong cord to reach the bottom at the place selected. One end of this cord will be securely fastened to the wire handle at the upper end of the cylinder inclosing the thermometer.

In making the observations, the observer will first note the temperature of the air, then that of the surface-water by immersing the thermometer in the upper stratum of water; and then, lowering the cylinder slowly to the bottom, will allow it to rest there long enough to fill; after which it will be drawn quickly to the surface, and the temperature shown by the thermometer carefully noted. The water will be poured out of these cylinder after each observation, and the thermometer thoroughly dried.

These observations will be recorded on Form 31.

WIND-VANE.

35. The observation of the vane requires more care than is usually given. In winds considerable strength the vane is never at rest or fixed in the same direction; it oscillates incessantly, and its oscillations increase in extent with certain winds, and with the violence of the wind. In such cases observers must *note the mean direction* between the extremes. When the wind is too light to move the vane, and when it is calm, no direction will be recorded. The attention of observers is called to this matter in order to prevent them from recording a direction of the wind when it is calm. The direction of the wind will be designated by the eight principal points of the compass, beginning with the north and moving around by the eastward, and numbered from one to eight respectively.

In reporting changes in the *direction* of the wind, the terms *veering* and *backing* will be used. The term *veering* indicates the changing of the wind from N. to E. to S., and so on, or in the direction corresponding with the movements of the hands of a watch; while *backing*, being the reverse term, indicates that it changes from N. to W. to S., and so on.

RAIN-GAUGE.

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71. The rain-gauge will be placed, whenever practicable, with the top of the funnel-shaped collector twelve inches above the surface of the ground, firmly fixed in a vertical position, and protected from the interference of unauthorized persons. It will be examined at the time of making each of the three telegraphic observations, the amount of water it contains carefully measured by means of the graduated rod sent with each gauge, and then emptied and returned to its proper position. When a position at the level of the ground cannot be found with a sufficiently clear exposure, the gauge will be placed on the top of the instrument-room, or roof of the building occupied by the observer, who will measure the height above the ground and report it to this office. The measuring-rod is graduated in inches and tenths of inches, and the proportion between the cylinder and funnel is as ten to one, so that ten inches upon the rod correspond with one inch of actual rain-fall, one inch on the rod to one-tenth of rain, and one-tenth on the rod to one-hundredth of rain. Snow will be melted, and then measured and reported in the same manner as rain, but the fact of its being melted snow must be noted under the head of remarks in the weekly reports. Whenever from any cause the snow cannot be melted, the depth will be measured and ten inches of snow reported as one inch of rain-fall.

WATER-GAUGE.

Care must be taken, in making observations when the water is rough, to get the mean of the rise and fall of the waves. After securing the gauge, fix some point of reference, so that in case it should be destroyed another could be put up at the same height. This may be done by marking on some given point in the vicinity any given height of the water.

SUNSET OBSERVATIONS.

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The observer at each station will note, each day, at the exact time of sunset (which he will be furnished for this purpose), and for a time not to exceed thirty minutes after sunset, the character of the western sky and of the sunset, and will state this character at the time, in writing, as "Fair-weather sunset," "Doubtful sunset," or "Foul-weather sunset." The term "Fair-weather sunset" will express such condition of the sky, particularly the western, and such character of the sunset as is considered to indicate a clear day for the day ensuing. The term "Doubtful sunset" will indicate that the conditions are such as to leave the mind of the observer in doubt

as to what the sunset presages for the following day. The term "Foul-weather sunset" indicates that the sun is wholly obscured by clouds, and the appearances indicate a rainy, stormy, or unpleasant day for the day following.

1. A sunset prediction of one day is verified, or not verified, as the case may be, by the weather until sunset of the ensuing day.

2. The prediction "Foul" or "Fair" refers especially to rain, and does not refer, in any way, to amount or kind of clouds or fog.

3. The prediction "Foul" means that the appearance of the sky indicates *rain*; if *any* rain equaling or exceeding one one-hundredth of an inch falls before sunset on the ensuing day, the prediction is verified, and if not, it is *not* verified.

4. FAIR means that the appearance of the sky does not indicate rain, and if no rain equaling one one-hundredth of an inch falls, the prediction is verified; if *any rain* in excess of this amount does fall, the prediction is *not verified*.

5. DOUBTFUL sunsets cannot be verified.

6. The sunset prediction should be the last entry in the journal and abstract for the day, and its verification, as determined by the weather from the hour of prediction up to sunset of the ensuing day, will be entered on the same line with it.

The observer will endeavor to note either "Fair weather" or "Foul weather," noting as few "Doubtful" as possible. It is considered that practice will be found to make this comparatively easy. The note made for each evening will, at sunset *next* day, be noted in writing as "verified" or "not verified."

From and after the date at which the receipt of this order is acknowledged by telegraph from each station, it will be understood that an additional word is supposed to be add-d to the "midnight" telegraphic report from that station. If, after the cipher-word for thermometer, and before humidity, no word is added, it will be understood at this office that the station reporting reports a "Fair-weather sunset." If the station reports a "Doubtful sunset," it will do so by adding after the cipher-word for thermometer, and before humidity, the word "Doubt." If the report is "Foul-weather sunset," it will add in the same space the word "Foul."

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FORMS.

108. The following-named meteorological forms are furnished by this office for station use:

Form 1.—Telegraphic river-report.
Form 2.—Receiving-sheet.
Form 3.—Daily bulletin.
Form 4.—Weekly meteorological report.
Form 5.—Telegraphic report.
Form 8.—Weather-map.
Form 15.—Synopsis and indications.
Form 16.—Monthly chart.
Form 22.—Monthly mean.
Form 23.—Cautionary-signal blank.
Form 24.—Record of bulletins.
Form 25.—Telegraphic-message form.
Form 26.—River-bulletin.
Form 27.—Special river-report.
Form 28.—Regular weekly river-report.
Form 30.—Weekly instruction-report.
Form 31.—Weekly report—temperature of water.
Form 32.—Monthly report—temperature of water.
Form 33.—Comparative barometric readings.
Form 34.—Annual mean or meteorological summary.
Form A.—Record of telegrams refused by telegraph company.
Form B.—Record of telegrams sent and received.
Check-lists.

109. Form 1 is used by the special river-observers for their reports, and should be made in duplicate; one copy for file in the telegraph-office at the schedule-times, and the other to be forwarded to this office at the end of each week.

110. Form 2 is for the use of the telegraph-operators in receiving the reports from other stations, and will be furnished by the observers in such quantities as may be required, care being taken to guard against wasteful and unnecessary use. The spaces will be filled up in regular order, commencing at the upper left-hand corner, and filling each space to the right in succession on the first line, and then commencing at the left-hand space of the second line, and so on. Observers will require the receiving-operators to sign and date each sheet, and also to note the time the reports upon it were received before taking it from the telegraph-office. The time of receipt from the operator will be noted by the observer or assistant. When the reports are received in dupli-

cate by the operator, observers will retain the original sheets furnished them by this office.

After the reports are translated and entered in the bulletin, the receiving-sheets for each full report will be placed together, and folded neatly in three folds, parallel with the writing.

Each morning the three reports of the preceding day will be secured together, so as to form a single package. At the end of each week the seven daily packages of the week will be put in one neat package, and forwarded by mail to this office, with the name of station plainly written upon the outer fold of the outside sheet.

111. Form 3 is the daily bulletin issued for public information. The several columns will be filled up from the receiving-sheet, the words and figures being written plainly and distinctly.

When any part of a report is not received, or, if received, is evidently incorrect, the word "blank" will be written in the spaces to be filled by such part.

Absence of wind, of clouds, rain-fall, or change in barometer, thermometer, and river, will be indicated by the figure zero.

112. Form 4 is the weekly report, and three copies will be forwarded to this office at the end of each week—one copy containing the full record of the telegraphic series of observations, one the record of the local series, and the third that of the midday observations.

In filling up this form, the *daily* means of the *local* (7, 2, and 9 o'clock) and the *weekly* means of the *telegraphic* barometric and thermometric observations will be entered in their proper columns, and the words "daily" and "weekly," respectively, added to the heading.

In the telegraphic series will be given, firstly, the mean of the morning; secondly, that of the afternoon; and, thirdly, that of the midnight observations.

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115. An additional column will be ruled, under the head of "Remarks," on Form 4, containing the series of telegraphic observations, in which the a. m. readings of the minimum thermometer will be recorded.

An additional column will be ruled, under the head of "Remarks," on Form 4, for each series of observations, in which will be recorded the state of the weather. Absence of wind, clouds, rain-fall, &c., will be indicated by the figure zero.

When the upper clouds are obscured, the word "hidden" will be written on Form 4 in appropriate column.

116. Form 5 will be used for all telegraphic reports, and will be made out each time in duplicate, one copy for file in the telegraph-office for transmission by telegraph, and the other for transmission by mail to this office.

In making the duplicates of this form, carbon-paper and the stylus will be used, and *both* copies written at the same time.

The times of filing in the telegraph-office and the transmission of the reports must be filled in by the operator who receives and transmits them and verified by his signature.

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124. When rain, snow, hail, or sleet have occurred since the last telegraphic report, and the quantity collected in the gauge is not sufficient to measure at the time of observation, the cipher-word "JOHNSON" will be written on Form 5 in the proper space to indicate precipitation, had it been measurable.

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130. Form 15 is for the synopsis and indications, and a copy properly filled up will be posted with each bulletin at all stations where they are received, and at which the farmers' bulletins are not printed. The midnight indications will be used with the morning bulletin, and the morning indications with the afternoon bulletin, whenever practicable. At stations where the afternoon, and not the midnight, indications are received, they will be used with the bulletin of the next morning.

In all cases the time and date of issue from Washington must be plainly written upon the form.

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132. Form 16 is the meteorological chart, to be made out monthly at each station, and forwarded by mail to this office not later than the 10th of the month succeeding that for which it forms the record. In filling up this form, the following instructions will be observed:

The time of beginning and ending of all auroral displays will be recorded in the spaces between the two upper lines, and under the proper dates, neatly written in black ink, the word auroras being written on the margin to the left of this record.

For the thermometer, take the daily reports, beginning with the morning-report of the first day of the month; with a sharp pencil make a dot on the chart at the height at which the dry-bulb thermometer stood at the first observation, at its proper relative distance from the 12 m. (midday) line, as shown in Plate 2. Dot in a similar manner

each of the seven observations. Join these dots with the pencil and after trace with ink.

Continue the same process with the wet-bulb thermometer, barometer, velocity of the wind, and the relative humidity, making the direction of the wind in small letters opposite each observation.

The average amount of clouds for each day will be given in the space immediately above the 29.00 inch line on the chart, dividing the squares into 1, 2, 3, and 4 4ths respectively.

133. In deciding whether a day is clear, fair, or cloudy, its character will be determined by taking the sum of the entire number of fourths of clouds observed at 7 a. m., 2 p. m., and 9 p. m. A clear day will be one in which the sum of the observed fourths is three or less than three; a fair day, one in which the sum is from four to eight inclusive; and a cloudy day, one for which the sum is from nine to twelve, inclusive.

In filling up Form 16, the average cloudiness (in fourths) for the day will be entered. Average cloudiness will be found by dividing by three the sums above taken, and will be indicated as follows:

0 when the sum of the three observations is 0 or 1
1 when the sum of the three observations is 2, 3, or 4
2 when the sum of the three observations is 5, 6, or 7
3 when the sum of the three observations is 8, 9 or 10
4 when the sum of the three observations is 11 or 12

134. The commencement of rain or snow will be indicated by a fine line one-sixteenth of an inch, or less, in length; the rate of fall by a broken curved line, indicating the greater or less rapidity of the same; and the amount of water by a heavy straight line, conformably to any adopted scale, and with its right edge resting at the point representing the time it ceased. Should rain or snow continue falling after the midnight observation of any day, the heavy straight line, showing the amount fallen up to that time, will be drawn, while a second broken curved line will be started to show the continuance of the same.

The scale may be changed for a greater fall of rain than 1¼ inches or a greater velocity of wind than 35 miles per hour, but in all cases the scales used must be made to cover equal fractional parts of inches and equal numbers of miles.

135. The mean barometer, mean temperature, prevailing wind, total number of miles traveled by the wind, and total rain-fall for the month must be entered in their proper places on the margin of the chart.

The name of the station and month for which prepared must always be plainly written on the right margin of the form. The range of temperature will be shown for each day by a vertical line crossing the temperature-curve.

136. Form 22 is used for the record of the daily and monthly means of the barometer and thermometer, with the prevailing direction of the wind, amount of rain-fall, and other data for the month.

In filling up this form, the daily means of the barometer and thermometer for the local series of observations will be obtained by dividing the sum of the 7 a. m., 2 p. m., and *double* the 9 p. m. observations by four.

The mean daily humidity will be obtained by dividing the sum of the 7 a. m., 2 p. m., and 9 p. m. observations by three. The *monthly* means will be obtained by dividing the sum of the daily means by the number of days observations taken during the month.

The monthly mean of the *telegraphic* observations will be obtained by dividing the sum of the observations in each column by the number of days.

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138. Form 23 is for use at stations designated for the display of cautionary signals, and will be filled up and forwarded weekly to this office, whether signals have been ordered or not.

In the column of "Remarks" will be noted such special cases of benefits to commercial or other interests as may come to the observer's knowledge, and also the passage over the station of any storm for which signals were not ordered, with date and time, and the maximum velocity attained by the wind in each case. All casualties resulting from storms at any cautionary station will be reported so far as they come within the knowledge of the observer.

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141. Form 26 is the river bulletin, and will be filled up as indicated by the several headings, and posted in such places as are found necessary to give suitable publicity to the reports and meet the wants of business men interested in them.

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143. Form 28 is for use at *all* river-stations, whether *regular* or *special*, and will be forwarded weekly to this office, properly filled up, as indicated by the several headings. Under the head of "Remarks" on this form will be noted all unusual occurrences connected with the stage of water in the river at and near the station, such as

the presence of floating ice, timber, &c.; formation and breaking of ice-gorges and other obstructions; damages to levees; time of opening and closing of navigation; accident to gauge or change in location of same, &c.

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145. Form 31 is the weekly report of observations on temperature of water, one copy of which, properly filled up, will be forwarded regularly to this office and one copy retained for station-file.

146. Form 32 is the monthly report of observations on the temperature of water, of which *two* copies will be forwarded to this office on the first day of the month succeeding that of which it forms the record. The precise nature of the spot where the water-temperatures are taken must be noted under the head of "Remarks."

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148. Form 34 is for the annual mean, or meteorological summary, which must be posted up in a conspicuous place in the observer's office. On this form will be entered, on the first day of each month, the data for the preceding month, as indicated at the top of the several columns. A carefully-compared copy of this form must be forwarded to this office within fifteen days of the close of the year of which it forms the record, the original being kept for station-reference.

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154. In the journal will be entered daily all matters of interest not provided for in the various forms, such as meteoric and auroral displays, earthquakes, and unusual atmospheric appearances and disturbances, giving, in each case, when possible, the time of beginning and duration of each. Especially will the observer enter a detailed account of the characteristic phenomena of every serious storm that passes over his station. In this book will also be noted all changes in location of office or instruments, the condition of the instruments, and, when damaged in any way, the cause of injury.

155. Observers will be particular to note in the journal every display of aurora, seeking by inquiry of others, if necessary, to make their record complete.

If the sky is obscured by clouds, so that the aurora, if present, cannot be observed, the word "obscured" will be entered in that part of the record devoted to auroral displays. If the sky is sufficiently clear for observation, the words "aurora" or "no aurora" will be entered according as one is visible or not. When observed, a full account of the phenomena will be entered in the journal, showing the exact minute of beginning and ending of the aurora, and the principal phases of changes that it experiences. The following particulars should be noticed: the azimuth and altitude of each extremity and of the crown of any arch of light, and the same data for any corona or glory that may be formed.

When the observer is familiar with the names of the principal fixed stars, he may locate the arch or crown by reference to them; but it is preferable that he should observe directly the altitude and azimuth.

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157. Observers must be particular as to the date of the aurora; and when it begins in the evening of one day and continues into the early morning of the next day, it will be entered as occurring on the *first* day, but its details will be given in the record as occurring between the hours of its actual beginning and ending. Thus, an aurora that began on the evening of the 12th of January, and continued until the early morning of the 13th, would be entered as the aurora of the 12th, but its details would be recorded as occurring, for instance, between the hours of 10 p. m. of January 12, and 2 a. m. of January 13.

158. All entries in the journal of occurrences and observations of any one day will be made under or opposite to that day, and not be entered as a subsequent date, as is frequently done. For example, an auroral display occurring May 23, should be entered opposite that date, and not referred to on the 24th, as having occurred "last evening."

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160. A monthly abstract of the entries in the journal will be forwarded to this office from stations east of the 100th meridian, within five days after the expiration of each month. At stations west of that meridian they must be mailed not later than the second of the month. This abstract must contain all the important entries of the journal, especial care being taken to exclude all matter relating to the ordinary routine of observations that are given on the various forms. The abstract should show clearly and briefly all matters of interest not provided for in the regular forms, such as meteoric and auroral displays, earthquakes, and other unusual atmospheric phenomena, giving, whenever practicable, the time of beginning and duration of each. In each day's abstract the subject of auroras will be noted briefly, in the authorized manner.

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162. At river-stations, all special phenomena that affect navigation will be noted, such as date of high and low water during the month, with monthly range at station;

closing of river by ice; formation of ice or other gorges, with effect upon navigation, &c.

163. At lake and sea-coast stations, the number of cautionary signals displayed during the month will be reported, with results as far as known at each station; number of storms that passed over station for which cautionary signals were not ordered, dates, with velocity of wind, being stated in each instance.

164. Each abstract must show at its head the name of the station and month for which it is prepared, and at its close the official signature of the person making it. To facilitate reference, marginal notes will be made in red ink at the left of the vertical line on each page, upon the prominent subject mentioned in the text, as "aurora," "rain," "snow," "hail," "earthquakes," &c.

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167. The daily record of observations will be an exact copy of Form 4 and filled up in the same manner. The several series of observations will be entered in the same book, care being taken to date and time them properly. The telegraphic series will be entered first, followed by the local and midday series.

168. The record of bulletins, when its use is authorized at any station, will be filled up regularly from the daily bulletins, of which it is a copy.

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ORIGINAL RECORD OF OBSERVATIONS.

178. The "original record" is intended to furnish the central office with data for the correction of errors made at the several stations in reducing and copying the observations. To make it of any value for this purpose, the readings of the different instruments must be entered as made, and *not* copied in from a slip of paper. Observers will habitually carry this book when making an observation, and enter the readings in *pencil*, as noted at the time. They will also use this book for making the proper corrections, as indicated by the marginal references. Pen and ink must *not* be used for entering any observation or correction.

The velocity of the clouds will be indicated by a single letter, following the direction, as follows: C for "calm," S for "slowly," and R for "rapidly."

The character of wind will be indicated by the letters S for "steady," and V for "variable," following the direction.

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250. Observers will give close attention to the observation and record of all local premonitory signs of storms or changes of weather, and report them promptly to this office. The following points should be particularly noted before, during, and after a storm or change of weather: Direction and force of the wind; kind, direction, motion, and appearance of the clouds; action of the barometer and thermometer, and such other purely local causes as appear to influence the results.

251. The attention of sergeants, or other enlisted men in charge of stations, is directed to the fact that they are required to make the reports absolutely correct, and that any shortcoming in this respect renders them liable to punishment. Aside from this, it should be kept constantly in mind that a single incorrect report may cause the loss of life and property to an unknown amount, and all reports must be made with this responsibility clearly in view. Whenever an observer is unable from any cause to get in his report, properly corrected, at the regular hours of report, he will *not* send the uncorrected portion, but will write the word "blank" in each of the spaces that would otherwise have been occupied by this portion of the report. Observers will *never* send any report or part of report which they have reason to believe is incorrect, and will bear in mind that it is safer and more in accordance with instructions to omit a report than to make a false one.

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PAPER 22.

OFFICE OF THE CHIEF SIGNAL-OFFICER,
Washington, D. C., October 25, 1877.

[Circular No. 11.]

This circular is published for the information of persons desiring to enter the service of the United States, with reference to the full duties of the Signal Service of the Army, including not only field-signals and telegraphy, but also the observation and report of storms, by telegraph and signal, and display of cautionary signals for the

benefit of commerce and agriculture, under the joint resolution of Congress, approved February 9, 1870, the acts of Congress, approved June 10, 1872, March 3, 1873, June 23, 1874, and March 3, 1875, and the authorization of the Secretary of War, and for such other duties as may be required in connection therewith.

1. Entrance into this service is in every case by enlistment as a private soldier in the Regular Army of the United States, the pay, quarters, allowances, and duties being, in the first instance, and unless changed after instruction, detail, or promotion, as hereinafter explained, those of a private soldier in the Signal Service U. S. A. All men enlisted are drilled in the use of arms and disciplined in the duties of soldiers. The term of service is five years, unless sooner discharged. The Secretary of War has power to grant discharges, which this office is authorized to promise when applied for on proper grounds, and at times when no special injury to the service would result therefrom; but, as a rule, no application for discharge will be favorably entertained until after two years of faithful service, and not then except as above specified. With the single exception that men enlisting for the Signal Service will not be transferred to any other branch of the Army, no promise will be given which can alter or affect the usual terms of enlistment. The service, while strictly military, is also probationary, with opportunities for advancement, depending mainly on the good conduct and capacity of each individual, and it is intended to place competent men, who enlist with a view to promotion to the grade of sergeant, on duty where instruction can be obtained and opportunity for study afforded.

The Chief Signal-Officer, in his annual report for 1871 to the Secretary of War, recommended that a commission in the Army be given each year to the sergeant who shall in that year be reported as most distinguished for fidelity and ability, and in each of several subsequent years an enlisted man of the Signal Service was promoted to be a commissioned officer.

2. Enlistments are confined to candidates who have passed an examination prior to enlistment before a board appointed by the Chief Signal-Officer, which meets at this office every Thursday at noon, and before which they must appear at their own expense if coming from a distance. Testimonials as to good character and capacity, signed by persons known at this office, must be presented, together with an application in the handwriting of the candidate (addressed to the Chief Signal-Officer of the Army), stating his age, past and present avocation, and residence. The examination will be chiefly directed to accurate spelling, legible handwriting, proficiency in arithmetic, with special attention to decimal fractions and the geography of the United States. After a favorable report from the above-mentioned board, and also a physical examination by the surgeon, the candidate will be enlisted for the Signal Service and, as a rule, will be ordered for duty to Fort Whipple, Va., near this city, where the Signal-Service detachment and school of instruction is stationed, where he will be placed under the drill and discipline requisite for the Signal Service, which will continue for not less than two months. After that time, his conduct being good and being reported as competent in drill and discipline, he will be ordered under special instruction to prepare for the duty of assistant to an observer on station; also performing the general duties of a soldier at hours when not required for instruction. When reported by the instructor as qualified, the enlisted man will, as the wants of the service require, be detailed on the above-mentioned duty of assistant. The length of time between being ordered under instruction and being detailed as assistant varies with the capacity and conduct of the individual, but has averaged about six weeks.

3. All soldiers of the Signal-Service who have passed the above-described examination, and have been instructed and detailed on duty as assistant to an observer on station, or similar duty at this office, are required to perform such duties satisfactorily for twelve months before promotion from private to sergeant. As a rule, such men may, after the expiration of that time, be ordered to Fort Whipple as candidates for promotion, and after additional instruction, drill, and discipline in the duties of soldiers, are examined by a board of final examination, also appointed by the Chief Signal-Officer, and meeting at this office, but differing from the board of preliminary examination before mentioned, both in its members and the character of examination, the latter being exclusively on the course of study and practice in reference to the special duties of the service, with which the candidate has had the opportunity to become familiar after his enlistment. They will also be examined by a board of officers, convened at Fort Whipple, as to their proficiency in the military duties of a sergeant. On passing these examinations the candidate will, as vacancies occur, be promoted to be sergeant, Signal-Service, United States Army.

4. The duties of a sergeant on station, as also those of an assistant to an observer, will be chiefly those pertaining to the observation, record, and proper publication and report, at such times as may be required, of the state of the barometer, thermometer, hygrometer, rain-gauge, and other instruments (instruction in the use of which will be given under the directions of this office), and the report by telegraph or signal at such times as indicated and to such places as may be designated by the Chief Signal-Officer, of the observations as made, or such other information as may be required; the tele

graphic reports to be forwarded by the regular telegraphic operators, or in such manner as may be directed. The utmost precision will be required in observations and reports. The specification of these particular duties is not to exclude such others connected therewith as may be necessary.

The object of this plan is to insure the correctness and regularity of reports by having them made under military control. As it is desired to make this body of men especially select, rigid examinations will be insisted upon.

All the duties will be performed strictly under the discipline of military law; all persons in the military service being subject to trial and punishment under the Rules and Articles of War for improper conduct or neglect of duty. The penalties for neglect of duty, bad conduct, &c., are dishonorable discharge, or such other punishment as a court-martial may direct, or as may be provided for by the customs of the service.

The United States is entitled to the whole time of the person enlisted; but the duties required on stations are of such a nature that, with care and diligence, some time between the hours of reports, when no active duty is pressing, will generally be at the disposal of the soldier, which may be devoted to reading or study. Most of those already enlisted have had such purposes in view. No employment of this nature can, however, be permitted to interfere in any way with that prompt and constant attention to duty which will be insisted upon.

5. The pay and allowances of both sergeant and private vary according to the character and place of the duties and the length of the service of each individual. The following table exhibits the average per month for five years, according to the present law:

Rank.	When at Fort Whipple, Va., or at a military post.	When on station.	When at this office.
Sergeant	$33 30	$76 11	$93 92
Private	18 44	59 25	89 71

Of the above amounts $1 per month in the third year, $2 per month in the fourth year, and $3 per month in the fifth year are retained, and will not be paid until final discharge after faithful service. An allowance for clothing, averaging $4.45 per month for sergeants, and $4.24 for privates, is also included in the above, which, if clothing is not drawn in kind, is also retained until discharge. When at Fort Whipple both sergeants and privates receive quarters and rations, and at all places are, when ill, provided with medical attendance and medicines.

6. Applications being frequently made for enlistment in this service, conditioned upon the applicant being placed upon some specified duty or stationed at a particular place, it is to be clearly understood that no such qualification of the contract of enlistment will be allowed or considered, the wants of the service, which cannot be known in advance, regulating all details of duty.

By order of the Chief Signal-Officer of the Army:

H. H. C. DUNWOODY,
First Lieutenant Fourth Artillery, Acting Signal-Officer and Assistant.

Official.

Acting Signal-Officer and Assistant.

——— ———, the undersigned, having read and understanding the above circular, do, in accordance with its terms, offer ——— for enlistment as a private soldier in the Signal-Service, United States Army.

Place.	Date.	Signature.	Witness to signature.

NOTE.—The above form is to be used at the time of enlistment, and is not received as the application mentioned in paragraph 2 of the foregoing circular.

PAPER 22½.

[Circular No. 7.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL-OFFICER,
Washington, D. C., March 10, 1874.

The following rules will be observed in addition to those contained in General Orders No. 28, War Department, Office Chief Signal-Officer, dated Washington, September 1, 1873:

The officer or assistant in charge of the preparation of facts, &c., for publication, will, in addition to his other duties, determine the percentage of verification of the current probabilities, in accordance with the following instructions:

1. The blank forms already prepared to facilitate this work will be used with the following modifications: The column of the blank headed "Wind velocity" will not be used. The percentage of verifications of predictions referring to wind will be determined by considering only that portion of the predictions which refers to the direction of the wind. Predictions referring to the velocity of the wind are of decided importance, and should be frequently made, but the limited number of stations now reporting will not justify the consideration of such predictions as an independent element of verifications.

2. The sixth column of the blank will be used for special predictions, and so designated. Three blanks will be used for each month's percentages, and will be numbered, respectively, 1, 2, and 3. Blank No. 1, referring to New England, Middle States, South Atlantic States, and Eastern Gulf States; blank No. 2, referring to the Lower Lakes, Upper Lakes, Tennessee, and Ohio Valley, and Western Gulf States; blank No. 3, referring to Upper Mississippi Valley, Lower Missouri Valley, the Northwest, and the Pacific States.

3. The probabilities made up from each report will be carefully compared with the facts as obtained from the three succeeding tri-daily reports, unless the prediction applies to a definite time, in which case the prediction will determine the facts with which it is to be compared.

4. In estimation of percentages it will be determined whether the conditions announced as to prevail in each district named have prevailed over geographical sections of that district to the amount of one-fourth, one-half, three-fourths, or the whole of the extent of the district. All predictions which are found to be more than three-fourths verified will be considered completely verified, and represented by 100, or 100 per cent., in that column of the blank to which the prediction refers. Predictions which are not wholly verified will be represented in the proper column of the blank by 75 per cent., 50 per cent., or 25 per cent., as the facts may warrant. Predictions which fall below 25 per cent. in verification will be rated as not verified, and represented by 000 in the proper column.

5. If, in the probabilities for any particular district, any class of prediction is not referred to, such omission will be represented by a dash (—).

6. The percentage of verifications of a single class of predictions will be determined by dividing the sum of the percentages of that class for the month by the number of predictions of that particular class. The percentage of verifications of probabilities for any district will be determined by dividing the sum of the percentages of the several classes of predictions by the number of classes.

The percentage of verification of probabilities for the United States will be determined by dividing the sum of the percentage of verifications of probabilities by the number of districts.

7. A maximum percentage of verifications can only be obtained when the four elements under each district are named in the probabilities of the entire month.

8. The percentage of failures to predict for any element will be determined by dividing the number of failures to predict for that particular element by the entire number of tri-daily reports during the month.

By order of the Chief Signal-Officer of the Army.

GARRICK MALLERY,
Capt. and Brt. Lieut. Col., U. S. A.,
Acting Signal-Officer and Assistant.

PAPER 22½.

Percentage of verification of probabilities for the month ending April 30, 1875.

April.	New England.					Middle States.					South Atlantic States.					Eastern Gulf States.					Western Gulf States.				
	Weather.	Wind, direction.	Temperature.	Barometer.		Weather.	Wind, direction.	Temperature.	Barometer.		Weather.	Wind, direction.	Temperature.	Barometer.		Weather.	Wind, direction.	Temperature.	Barometer.		Weather.	Wind, direction.	Temperature.	Barometer.	
1	100	100	100	100	....	100	100	100	100	....	25	100	100	0	....	100	75	100	100	..	50	100	100	100	....
	50	75	100	100	....	100	100	100	100	....	100	50	75	50	....	100	100	100	100	....	100	0	100	100	....
	100	100	25	75	....	100	100	100	25	....	100	50	100	0	....	100	100	100	25	....	100	100	75	100	....
2	75	100	100	100	....	100	50	100	100	....	100	75	100	100	....	100	100	100	100	....	100	75	100	100	....
	75	100	75	0	....	100	25	100	100	....	100	100	100	100	....	75	0	100	100	....	100	75	100	100	....
	100	100	100	100	....	100	100	100	100	....	75	100	100	100	....	100	0	100	100	....	100	75	100	75	....
3	75	75	100	50	....	100	100	100	100	....	100	100	100	100	....	100	75	100	0	....	100	100	100	100	....
	100	0	100	100	...	75	0	100	0	....	75	100	100	100	....	100	75	100	100	....	100	100	100	75	....
	100	25	100	50	....	100	25	100	50	....	100	25	25	100	....	100	100	100	100	....	50	100	100	100	....
4	75	0	100	100	...	100	0	100	100	....	100	75	100	100	....	100	100	100	100	....	100	100	100	100	....
	75	100	100	100	....	75	100	100	100	....	100	100	100	100	....	100	100	100	100	....	50	100	100	100	....
	100	100	100	100	....	100	100	100	100	....	100	100	100	75	....	100	100	100	100	...	100	100	100	100	....
5	100	100	100	100	....	100	100	100	100	...	100	100	100	100	....	100	100	100	100	....	75	100	100	100	....
	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	75	100	100	100	....
	100	75	100	75	...	100	100	100	75	...	100	100	100	100	....	100	100	100	100	...	100	75	100	100	....
6	25	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	0	100	100	100	....
	75	100	100	100	....	100	75	100	100	....	100	100	100	100	....	100	100	100	100	...	75	0	0	0	....
	75	100	100	100	....	50	100	0	100	....	100	100	100	100	....	100	100	100	100	....	75	100	100	100	....
7	100	100	100	100	....	25	100	100	100	..	100	100	100	100	....	100	100	100	100	...	100	100	100	100	....
	100	100	100	100	....	50	100	100	100	..	100	100	100	100	....	100	100	100	100	....	50	100	100	100	....
	75	100	100	100	...	75	100	100	100	....	100	100	100	100	....	75	100	100	100	....	100	100	100	100	....
8	100	100	100	100	....	100	100	100	100	...	75	75	0	100	...	100	100	100	100	....	50	100	100	100	....
	100	100	0	100	....	100	100	0	100	....	100	100	100	100	...	100	75	100	100	...	100	75	100	100	....
	75	100	25	100	....	75	100	25	100	...	75	100	100	100	...	0	100	0	100	....	75	25	0	75	....
9	100	100	100	100	...	100	100	100	100	...	75	100	75	100	..	75	100	75	100	..	0	75	100	100	....
	100	50	100	100	...	100	50	100	100	...	100	100	75	100	....	75	100	100	100	....	50	100	100	100	....
	100	100	100	100	...	100	100	100	100	....	25	100	100	100	...	0	100	100	100	....	100	100	100	100	....
10	100	25	100	100	...	75	100	100	100	...	100	100	100	100	....	100	100	100	100	...	100	50	100	100	...
	100	75	100	100	....	100	75	100	100	...	100	100	75	100	...	100	100	75	100	...	100	100	100	100	....
	100	50	100	100	....	100	100	75	100	...	100	100	75	100	...	100	100	100	100	....	100	100	100	100	...
11	100	50	100	0	....	100	100	100	100	...	100	100	100	100	...	100	100	100	100	....	100	100	100	100	....
	75	50	100	50	...	100	100	100	100	....	100	100	100	100	...	100	100	100	100	....	100	100	100	100	....
	100	100	100	75	..	100	100	100	75	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....

Percentage of verification of probabilities for the month ending April 30, 1875—Continued.

April.	New England.					Middle States.					South Atlantic States.					Eastern Gulf States.					Western Gulf States.				
	Weather.	Wind, direction.	Temperature.	Barometer.		Weather.	Wind, direction.	Temperature.	Barometer.		Weather.	Wind, direction.	Temperature.	Barometer.		Weather.	Wind, direction.	Temperature.	Barometer.		Weather.	Wind, direction.	Temperature.	Barometer.	
12	25	100	100	0	....	50	100	100	0	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....
	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....
	100	100	100	100	...	100	100	100	100	....	100	100	100	100	....	100	100	100	100	...	100	100	100	100	....
13	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	...	....
	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....
	100	100	100	100	....	100	100	100	100	....	100	100	100	100	..	100	100	100	100	....	100	100	100	...	....
14	75	100	100	100	....	100	100	100	100	....	100	100	100	100	...	100	100	100	100	....	75	100	100	100	....
	100	50	100	50	...	75	50	100	100	....	100	75	100	100	...	100	100	100	100	....	75	100	100	100	....
	50	75	100	0	....	50	75	100	0	....	100	100	100	100	...	100	100	100	100	....	100	100	100	100	....
15	100	100	100	100	....	75	100	100	100	....	100	100	100	100	...	100	100	100	100	....	100	100	100	100	....
	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....
	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....
16	100	100	100	100	...	75	100	100	100	....	100	100	100	100	...	100	100	100	100	...	100	100	100	100	....
	100	100	100	100	...	75	100	100	100	....	100	100	100	100	...	100	100	100	100	....	100	100	100	100	....
	100	100	100	100	...	75	100	100	100	....	100	100	100	100	...	100	100	100	100	....	50	100	100	100	....
17	100	100	100	100	....	75	100	100	100	....	100	100	100	100	...	100	100	100	100	....	100	100	100	100	....
	100	100	100	100	...	100	100	100	100	....	100	100	100	100	...	100	75	100	100	...	100	100	100	100	....
	100	100	100	100	...	100	100	100	100	....	100	100	100	100	...	100	100	100	100	....	100	100	100	100	....
18	75	100	100	100	....	75	100	100	100	....	100	75	100	100	...	100	100	100	100	....	100	75	100	100	...
	100	100	100	100	...	100	100	100	100	....	100	75	100	100	...	100	100	100	0	....	50	100	100	100	....
	100	75	100	100	...	100	75	100	100	....	100	75	100	100	...	100	50	100	75	....	0	100	100	100	....
19	25	100	100	0	....	100	100	100	75	....	100	100	100	100	...	100	100	25	25	....	100	100	25	0	..
	50	100	100	75	....	100	100	100	100	....	100	75	100	100	...	100	100	100	100	....	100	100	75	100	....
	75	75	100	100	....	75	100	100	100	....	100	100	100	100	...	100	100	100	100	....	100	100	50	100	...
20	100	100	100	100	....	100	100	100	100	....	100	100	100	50	...	100	100	100	0	....	100	25	...	50	...
	100	75	100	100	....	100	100	100	100	....	100	100	100	100	...	100	100	100	0	...	100	100	...	75	....
	100	100	100	100	....	100	100	100	100	....	100	100	100	100	...	100	100	100	100	....	100	100	100	100	....
21	100	100	100	50	...	100	100	100	25	...	100	100	100	100	....	100	100	100	100	...	100	100	100	...	...
	100	100	100	0	....	100	100	100	0	....	100	100	100	0	..	100	100	100	100	....	100	100	100	100	...
	100	100	50	100	...	100	100	75	50	....	100	100	100	0	..	100	100	100	0	....	75	100	100	100	...
22	100	100	50	0	....	100	100	75	0	....	100	100	0	0	....	100	100	50	25	...	100	100	100	100	....
	100	100	50	25	....	100	100	100	25	....	100	100	100	0	....	100	100	100	75	...	100	50	100	50	....
	100	100	100	100	...	100	50	100	100	..	100	100	100	100	...	50	100	100	100	....	100	50	100	100	...
23	100	100	0	100	....	50	100	0	100	....	100	100	100	100	....	100	100	100	100	....	100	0	100	...	....
	100	100	100	0	....	100	100	100	50	....	100	100	100	100	....	100	100	100	50	....	100	75	100	75	....

24	100	100	100	100	....	100	100	50	0	....	100	100	100	100	....	100	50	.....	100	....	100	100	100	.....	....
	100	100	50	100	....	100	100	50	100	....	100	100	100	100	....	100	100	50	100	....	50	0	75	100	....
	100	100	100	100	....	100	100	0	100	....	100	50	100	100	....	100	25	50	25	....	100	50	100	100	....
25	100	100	100	100	....	100	100	100	100	..	100	100	50	100	....	100	100	25	100	....	100	100	50	100	....
	100	100	100	100	....	100	100	100	100	..	75	.....	75	50	....	100	100	100	100	....	100	50	100	50	....
	100	100	0	100	....	100	100	100	100	....	50	100	100	100	....	100	100	100	100	....	75	50	75	50	....
26	100	100	100	100	....	50	100	100	100	..	0	100	100	100	....	100	100	50	100	....	25	0	100	50	....
	100	50	0	0	....	100	100	100	0	..	100	100	100	100	..	100	75	75	100	....	25	.....	100	100	....
	100	100	100	0	....	100	75	75	100	....	100	100	100	100	....	100	50	0	100	....	100	100	100	100	....
27	100	100	100	0	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	50	50	100	....
	100	100	100	100	....	50	100	0	100	..	100	75	100	100	....	100	75	100	100	....	100	100	100	75	....
	100	100	100	100	....	100	100	25	100	..	100	100	100	100	....	100	100	100	100	....	100	75	100	.....	....
28	75	100	50	100	....	100	50	100	100	....	100	100	75	100	....	100	100	100	100	....	100	100	100	.....	....
	100	100	50	100	....	0	0	100	0	....	100	50	100	100	....	100	100	100	100	....	50	100	50	100	....
	50	100	100	100	....	0	25	100	0	....	100	50	100	100	....	100	100	100	100	....	100	100	100	100	....
29	0	75	100	100	....	0	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	75	100	100	....
	50	100	100	100	....	50	100	50	50	..	75	50	50	0	....	50	50	50	0	....	100	25	0	0	....
	75	100	100	75	....	100	100	50	100	....	50	100	100	100	....	25	100	50	25	....	100	25	25	0	....
30	25	100	100	100	....	100	100	100	100	....	50	75	100	0	....	75	100	100	100	....	100	100	100	100	....
	100	50	75	100	....	100	25	50	50	....	100	100	100	100	....	100	100	75	100	....	100	75	100	75	....
	50	100	100	0	....	50	0	50	50	....	50	50	100	75	....	50	100	75	0	....	0	50	100	50	....
Verifications:																										
Sums	7,925	8,075	8,100	7,350	....	7,850	7,925	7,950	7,500	...	8,375	8,225	8,450	8,000	...	8,450	8,350	8,225	7,825	....	6,700	7,425	8,050	7,425	....
Percentage by elements	88.1	89.7	90.0	81.7	....	87.2	88.1	88.3	83.3	....	93.1	92.4	93.9	88.9	...	93.9	92.8	91.3	86.9	...	74.4	83.4	91.5	89.5	...
Percentage by districts	.....	.....	.....	.....	87.4	.....	.....	.....	.....	86.7	.....	.....	.....	.....	92.1	.....	.....	.....	.....	91.2	.....	.....	.....	.....	84.6
Omissions:																										
Sums	0	0	0	0	....	0	0	0	0	...	0	1	0	0	...	0	0	0	0	....	0	1	2	7	....
Percentage by elements	0	0	0	0	....	0	0	0	0	...	0	1	0	0	...	0	0	0	0	....	0	1.1	2.2	7.8	....
Percentage by districts	.....	.....	.....	.....	0	.....	.....	.....	.....	0	.....	.....	.....	.....	0.3	.....	.....	.....	.....	0	.....	.....	.....	.....	2.9

Percentage of verification of probabilities for the month ending April 30, 1875—Continued.

April.	Lower Lakes.					Upper Lakes.					Tennessee and the Ohio Valley.					Upper Mississippi Valley.					Lower Missouri Valley.				
	Weather.	Wind, direction.	Temperature.	Barometer.		Weather.	Wind, direction.	Temperature.	Barometer.		Weather.	Wind, direction.	Temperature.	Barometer.		Weather.	Wind, direction.	Temperature.	Barometer.		Weather.	Wind, direction.	Temperature.	Barometer.	
1	100	100	100	100	....	75	75	75	100	....	100	100	100	100	..	25	75	75	100	..	0	75	100	100	....
	100	100	100	...	....	50	100	100	100	....	100	100	100	100	....	0	75	100	50	...	25	100	100	0	....
	100	100	50	100	....	100	100	100	100	....	100	75	100	100	....	100	100	100	100	...	75	100	100	100	....
	50	100	100	100	....	75	100	100	100	....	75	75	100	75	..	75	75	100	100	...	75	75	100	100	....
2	100	100	100	100	....	100	100	100	100	..	100	100	100	100	..	100	100	100	100	....	100	100	100	100	....
	100	100	100	100	....	100	100	100	100	....	100	100	100	100	...	100	75	100	100	...	100	75	100	100	....
	100	75	100	100	....	75	100	100	100	....	100	100	100	100	...	100	100	100	100	..	100	100	100	100	....
3	50	75	50	0	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	..	100	100	100	100	....
	75	25	100	100	...	100	100	100	100	....	100	50	100	100	....	75	100	100	100	....	75	100	100	100	....
	100	25	100	100	...	75	100	100	100	....	100	50	100	100	...	100	100	100	100	...	100	100	100	100	....
4	100	100	100	100	..	50	100	100	100	....	0	100	100	100	...	75	100	100	100	...	75	100	100	100	....
	...	....	....	....	....	100	100	100	100	...	100	100	100	75	...	75	100	100	100	...	100	100	100	100	....
	50	100	100	100	....	100	100	100	100	....	100	100	100	100	...	25	100	100	100	....	100	50	100	100	....
5	100	100	100	100	....	75	100	100	100	....	100	100	100	100	....	75	75	0	100	...	100	75	0	100	....
	50	100	100	100	....	75	100	100	100	....	100	100	100	100	...	100	100	100	100	...	100	100	100	100	....
	50	100	100	100	..	75	100	100	100	....	100	100	100	100	...	75	100	50	100	....	100	100	100	100	....
6	100	50	100	100	....	75	100	100	100	....	75	100	100	100	....	100	100	100	100	...	100	100	100	100	....
	100	100	100	100	....	...	...	...	...	....	100	100	100	100	...	100	75	0	0	...	0	0	100	...	....
	75	100	100	100	....	75	100	100	100	....	50	100	100	100	....	100	100	100	100	...	100	100	100	100	....
7	75	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....
	100	100	100	100	....	100	100	100	100	....	75	100	100	100	....	100	75	75	75	....	100	100	0	0	....
	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....
8	50	100	100	100	....	100	100	100	100	....	100	75	100	100	....	100	100	100	100	...	100	100	100	100	....
	100	100	100	100	....	100	100	100	100	....	50	50	100	100	....	100	100	100	100	....	100	100	100	100	....
	100	100	100	100	....	100	100	100	100	....	75	100	100	100	....	50	100	100	100	....	100	100	100	100	....
9	100	100	100	100	....	100	100	100	100	....	100	50	100	100	....	100	100	100	100	....	100	100	100	100	....
	100	100	100	100	....	50	100	100	100	....	100	50	100	100	....	75	75	75	75	....	75	75	75	75	....
	75	100	100	100	....	25	50	100	100	....	100	100	100	100	....	100	100	100	100	...	100	100	100	100	....
10	100	100	100	100	....	100	100	100	100	....	100	100	75	100	...	100	100	100	100	...	100	100	100	100	....
	100	100	100	100	....	100	100	100	100	....	100	75	50	100	....	75	100	100	100	...	75	100	100	100	....
	100	100	100	75	....	100	100	100	75	....	100	100	100	100	....	75	100	100	100	....	75	100	100	100	....
11	100	100	100	100	....	100	100	100	100	....	75	100	100	100	....	50	100	100	100	..	50	100	100	100	....
	100	100	100	0	....	100	100	100	0	....	100	100	100	100	...	100	100	100	100	...	100	100	100	100	....
	25	25	100	100	....	100	100	100	100	....	25	25	100	100	....	100	100	100	100	....	100	100	100	100	....
12	25	100	100	100	....	100	100	100	100	....	50	75	100	100	...	100	100	100	100	....	100	100	100	100	....
	75	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....

Percentage of verification of probabilities for the month ending April 30, 1875—Continued.

April.	Lower Lakes.					Upper Lakes.					Tennessee and the Ohio Valley.					Upper Mississippi Valley.					Lower Missouri Valley.				
	Weather.	Wind, direction.	Temperature.	Barometer.		Weather.	Wind, direction.	Temperature.	Barometer.		Weather.	Wind, direction.	Temperature.	Barometer.		Weather.	Wind, direction.	Temperature.	Barometer.		Weather.	Wind, direction.	Temperature.	Barometer.	
13	100	100	100	100	....	100	100	100	100	....	75	100	100	100	....	100	100	100	100	....	100	100	100	100	....
	100	100	100	100	....	100	100	100	100	....	100	75	100	100	....	100	100	100	100	....	100	100	100	100	....
	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	....	....	100	100	100	.. ..	...
	50	100	100	100	....	50	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....
14	100	100	100	0	..	100	100	100	0	....	75	100	100	100	....	100	75	0	0	..	100	75	0	0	....
	100	100	100	100	....	100	100	100	100	....	100	100	100	100	..	100	100	0	0	....	100	100	0	0	....
	100	100	100	100	....	100	100	100	100	....	100	100	100	100	..	100	100	100	100	..	0	100	100	100	....
15	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....
	100	100	100	100	....	100	100	100	100	....	100	100	100	100	..	100	100	100	100	....	100	100	100	100	....
	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	50	100	100	100	....	50	100	100	100	....
16	100	100	100	100	....	100	100	100	100	....	100	100	100	100	....	100	75	100	100	....	100	75	100	100	....
	75	100	100	100	....	75	100	100	100	....	100	100	100	100	....	100	50	100	100	..	100	50	100	100	....
	100	100	100	100	....	100	100	100	100	...	100	100	100	100	...	100	75	100	100	....	100	75	100	100	....
17	100	100	100	100	....	100	75	100	100	....	100	100	100	100	..	100	25	100	100	....	100	50	100	100	....
	100	100	100	100	....	100	100	100	100	....	100	100	100	100	...	100	100	100	100	....	100	100	100	100	....
	100	100	100	100	....	100	50	100	100	....	75	100	100	100	...	100	75	100	100	....	100	75	100	100	....
18	100	100	100	100	...	100	75	0	100	...	100	100	100	100	...	100	75	75	100	....	100	75	100	100	....
	100	0	0	100	..	50	25	50	100	....	100	100	100	100	...	75	75	100	100	....	75	75	100	100	....
	75	0	0	100	....	100	0	0	100	...	25	75	100	100	...	75	0	100	100	....	100	50	100	100	....
19	50	75	100	0	....	25	75	100	50	....	100	50	50	25	...	50	25	100	100	...	75	25	100	100	....
	50	100	100	100	....	75	100	100	100	....	100	100	50	75	....	100	100	100	100	....	100	100	100	100	....
	100	100	100	100	....	100	50	0	0	....	100	50	25	50	....	100	50	0	0	...	100	50	0	0	...
20	75	50	75	0	....	25	0	50	0	....	100	0	100	100	....	100	50	0	0	...	100	50	100	0	....
	100	50	100	100	....	50	50	0	50	....	100	100	100	75	....	75	50	75	50	....	75	50	75	75	....
	100	100	100	100	....	100	75	100	100	....	100	100	100	100	....	100	100	100	25	....	100	100	100	0	....
21	50	100	100	50	....	100	100	100	50	....	50	100	100	100	....	100	100	100	100	....	100	100	100	100	....
	100	25	100	0	....	100	75	100	25	....	100	100	100	100	....	0	50	100	0	....	0	50	100	25	...
	75	100	100	50	...	100	100	100	100	...	100	100	100	75	...	100	100	100	0	....	100	100	100	0	....
22	100	100	100	0	....	100	100	100	0	....	100	100	75	0	...	100	100	100	0	....	100	100	100	0	....
	50	50	100	0	....	25	100	25	0	....	100	100	100	0	...	100	100	50	50	....	100	100	100	0	....
	75	100	50	100	....	75	100	0	25	....	100	100	100	100	...	100	100	100	75	....	100	100	100	50	....
23	100	75	100	100	....	100	100	100	100	...	100	100	100	25	...	0	100	100	0	....	100	100	0	0	...
	100	50	100	100	...	50	100	100	100	....	75	100	100	100	...	0	100	100	100	....	100	100	100	100	....
	100	50	100	100	....	25	50	100	100	....	25	100	100	100	..	100	0	100	50	....	100	100	100	75	....
24	100	100	100	100	....	75	100	50	100	...	50	50	25	100	...	75	50	50	100	....	100	100	100	100	....
	100	100	50	100	...	100	75	50	75	....	50	100	25	50	...	100	50	50	0	....	100	100	50	75	...

Percentage of verification of probabilities for the month ending April 30, 1875—Continued.

April.	Lower Lakes.					Upper Lakes.					Tennessee and the Ohio Valley.					Upper Mississippi Valley.					Lower Missouri Valley.				
	Weather.	Wind, direction.	Temperature.	Barometer.		Weather.	Wind, direction.	Temperature.	Barometer.		Weather.	Wind, direction.	Temperature.	Barometer.		Weather.	Wind, direction.	Temperature.	Barometer.		Weather.	Wind, direction.	Temperature.	Barometer.	
25	100	100	100	100	...	75	100	100	100	....	100	100	50	100	....	100	100	100	100	...	100	100	100	100	....
	100	50	100	100	...	100	100	100	100	....	100	75	100	100	....	100	100	100	100	...	100	50	100	100	....
	100	0	100	50	....	0	25	25	100	....	100	50	50	100	....	50	100	50	100	...	100	50	50	100	....
26	0	25	100	100	...	0	25	100	100	....	100	50	100	100	....	25	50	100	100	...	50	50	100	100	....
	0	75	100	100	...	0	100	75	100	....	100	50	50	100	....	25	75	75	100	...	25	100	0	100	....
	0	75	100	100	...	100	75	100	100	....	100	0	75	.....	....	50	100	100	100	...	50	100	100	100	....
27	75	100	100	100	....	100	100	100	100	...	100	50	100	100	....	50	100	100	100	...	100	100	100	100	....
	100	50	50	100	....	100	100	100	75	...	100	100	100	100	....	100	100	50	100	...	100	100	50	100	....
	100	100	100	100	....	75	100	100	100	....	100	100	100	100	....	50	100	100	100	...	50	100	100	75	....
28	100	100	100	100	....	100	75	100	75	...	100	100	100	50	....	100	100	100	0	...	100	100	50	0	...
	100	100	100	100	....	100	50	100	100	....	100	100	100	100	....	100	100	75	100	...	100	100	75	100	....
	0	25	50	25	....	100	100	50	100	....	75	25	25	25	....	50	100	50	100	...	50	100	75	100	....
29	100	50	.....	100	....	100	50	100	100	....	100	50	100	100	....	100	100	100	100	...	100	100	100	100	....
	100	100	100	100	...	100	100	25	100	....	100	100	100	100	....	100	50	50	100	...	100	0	50	100	....
	100	100	75	100	....	100	75	75	100	....	100	50	50	0	....	75	50	75	0	...	75	0	50	0	....
30	75	100	100	75	...	100	25	100	100	....	100	100	50	100	....	100	50	100	100	...	25	50	100	100	....
	100	0	50	100	....	100	100	100	75	...	100	100	25	100	....	100	100	100	100	...	100	100	100	100	....
	75	0	100	25	...	50	50	100	100	....	0	0	25	25	....	75	50	75	100	.....	75	0	25	100	....
Verifications:																									
Sums	7,475	7,350	8,200	7,650	....	7,450	7,750	7,850	7,575	....	8,025	7,650	8,075	8,025	.....	7,475	7,675	7,775	7,350	...	7,775	7,650	7,825	7,250	....
Percentage by elements	.....	82.6	93.2	87.0	....	83.7	87.1	88.2	85.1	....	89.2	85.0	89.7	90.2	....	83.1	85.3	86.4	82.6	...	86.4	85.0	86.9	82.4	....
Percentage by districts	.....	.....	.....	.....	86.6	.....	.....	.....	.....	86.0	.....	.....	.....	.....	88.5	.....	.....	.....	.....	84.3	.....	.....	.....	.....	85.2
Omissions:																									
Sums	1	1	2	2	....	1	1	1	1	....	0	0	0	1	....	0	0	0	1	....	0	0	0	2	....
Percentage by elements	1.1	1.1	2.2	2.2	....	1.1	1.1	1.1	1.1	....	0	0	0	1.1	....	0	0	0	1.1	....	0	0	0	2	....
Percentage by districts	.....	.....	.....	.....	1.5	.....	.....	.....	.....	1.4	.....	.....	.....	.....	0.3	.....	.....	.....	.....	0.3	.....	.....	.....	.....	0.5

Total percentage of verifications by districts ..... 87.
Total percentage of omissions by districts ..... 00.

PAPER 23.

List of sunset stations and their telegraphic designations.

Stations.	Nos.
Austin, Nev	1
Barbara, Santa Barbara, Cal	2
Carson, Kit Carson, Colo	3
Central, Central City, Nebr	4
Deadwood, Dak	5
Deep Creek, Utah	6
Elmira, N. Y	7
Eugene, Eugene City, Oreg	8
Fetterman, Fort Fetterman, Wyo	9
Fillmore, Fillmore City, Utah	10
George, Saint George, Utah	11
Hamilton, Nev	12
Hat Creek, Dak	13
Lytton, British Columbia	14
Marie, Sault de Ste. Marie, Mich	15
Marys, Saint Marys, Wyo	16
Moines, Des Moines, Iowa	17
Monterey, Cal	18
Shaw, Fort Shaw, Mont	19
Sidney, Nebr	20
Trinidad, Colo	21
Victoria, Vancouver's Island	22
Wadena, Minn	23
Waterville, Kans	24
Westminster, New Westminster, British Columbia	25
Yreka, Cal	26

WAR DEPARTMENT, OFFICE OF THE CHIEF SIGNAL-OFFICER,
Washington, D. C., July 2, 1877.

The following rules in regard to sunset observations and verifications of reports based upon them are furnished for your information and guidance:

1. The observer at each station will note, each day, at the exact time of sunset (which he will obtain from circular No. 3, herewith inclosed), and for a time not to exceed thirty minutes after sunset, the character of the western sky and sunset, and will note in writing on Form Y, in the column for that date, the character at the time as "Fair-weather sunset," "Foul-weather sunset," or "Doubtful-weather sunset."

The term "Fair-weather sunset" will express such condition of the sky, particularly the western, and such character of the sunset, as is considered to indicate a fair day for the day *ensuing*.

The term "Foul-weather sunset" indicates that the appearances are such as to presage a rainy day for the day ensuing.

The term "Doubtful-weather sunset" will indicate that the conditions are such as to leave the mind of the observer in doubt as to what the sunset presages for the following day.

The prediction is for the period of time from the sunset of the day on which the prediction is made, until sunset of the following day; and at the expiration of the time for which the prediction is made the observer will note on Form Y, opposite the prediction and in the column headed "Report correct," the word *yes* or *no*, according as the prediction is or is not verified.

A sunset prediction of one day is verified or not verified, as the case may be, by the weather of the ensuing day.

The prediction "Foul" or "Fair" refers especially to rain, and does not refer in any way to amount or kinds of clouds or fog.

The prediction "Foul" means that the appearance of the sky indicates *rain;* if any rain equaling or exceeding one one-hundredth of an inch, falls before sunset on the ensuing day the prediction is verified, and if not, it is not verified.

"Fair" means that the appearance of the sky does not indicate rain, and if no rain equaling or exceeding one one-hundredth of an inch falls, the prediction is verified. If any rain in excess of this amount does fall, the prediction is not verified.

"Doubtful" sunsets cannot be verified.

As soon as the observation has been taken and entered on Form Y the report will be enciphered (or written) on Form 5, in duplicate, and the form handed to the operator in the telegraph-office as soon as possible after the observation is taken, for transmission to.....

The signature of the operator must be obtained to both copies of each report, with the exact time of receipt by him. The operator will retain one copy of the report; the observer will retain the other copy until Monday of the following week, when he will forward the retained copies by mail to this office in the same envelope as Form X.

In filling up Form 5, carbon paper and stylus will be used in the following manner: Two sheets of the printed forms will be raised up and the piece of sheet-tin placed beneath them; one of the sheets will be spread smoothly on the tin; on this sheet will be placed a piece of carbon paper, and the other form will be placed on this. When the cipher-words representing the readings of the instruments are written in the proper spaces of the Form 5, the report will appear in duplicate.

The observations will be written on the Forms 5 in the following manner:

The name of station ( ) will be written in the upper left-hand or first space; the cipher-word for the sunset prediction in the second space, and will be found in the table showing amount of clouds at the time, opposite the sunset prediction, and under the letters showing the direction from which the wind is blowing at the time of observations.

In the third space will be written the cipher-word found opposite the observed reading of the barometer.

In the fourth space will be written the cipher-word found opposite the readings of the dry-bulb thermometer.

In the fifth space will be written the cipher-word found opposite the readings of the wet-bulb thermometer.

In the lower left-hand space will be written the cipher-word corresponding to the amount of rain-fall since the observation of preceding day.

The report will be signed with the surname only of the observer.

Examples are given of the proper manner of filling up Form 5.

EXAMPLE.

Deadwood.	Abide.	Daunt.	Fiuny.	Finding.
Reduce.				

TRANSLATION.

Station	Deadwood.
Sunset	Fair.
Direction of wind	S. E.
Amount of clouds in fourths	0.
Barometer	29.85.
Dry-bulb thermometer	69°.
Wet-bulb thermometer	64°.
Amount of rain-fall since last report	1.20 inches.

EXAMPLE.

Fetterman.	Dimly.	Calver.	Fiddle.	Festive.
Rebuke.				

TRANSLATION.

Station	Fetterman.
Sunset	Doubtful.
Direction of wind	S.
Amount of clouds in fourths	¼.
Barometer	24.45.
Dry-bulb thermometer	44°.
Wet-bulb thermometer	33°.
Amount of rain-fall since last report	.85 inches.

EXAMPLE.

Hamilton.	Elope.	Apron.	Few.	Fennel.

TRANSLATION.

Station	Hamilton.
Sunset	Foul.
Direction of wind	E.
Amount of clouds in fourths	¼.
Barometer	18.75.
Dry-bulb thermometer	39°.
Wet bulb thermometer	23°.
Amount of rain-fall since last report	None.

If no rain has been collected in the rain-gauge since the last report the cipher word for rain-fall will be omitted from the report, and, until you have received a barometer, the word to express the reading of that instrument will also be omitted, and the words for the readings of dry-bulb and wet-bulb thermometers and amount of rain-fall be moved up one space.

The observation of the sunset, the direction of wind and amount of clouds will be made at the times given in Circular No. 3. The observations of barometer, thermometers, and rain-fall since observation of preceding day will be taken at each day.

In the form for the "Meteorological Record" for the week (Form X,) should be entered as soon as possible after the observation is taken, and in the proper columns, the date of observation, hour of observation, reading of Aneroid barometer, readings of dry and wet bulb thermometers, direction of wind, and velocity of wind in miles per hour (estimated from the Signal Service scale), amount of clouds in fourths time (a. m. or p. m.), rain or snow began and ended, amount of rain or melted snow since last observation in inches and hundredths of an inch, state of the weather, and any remarks about the weather which, in the opinion of the observer, will be of interest, such as dates of auroras, thunder-storms, &c.

This form, properly filled up, should be forwarded by the mail on Monday, in an envelope addressed

"THE CHIEF SIGNAL-OFFICER OF THE ARMY,"
"*Washington, D. C.*"

Form Y will be forwarded to this office on the *first* day of the month succeeding that of which it forms the record.

Instructions for reading the instruments.

ANEROID BAROMETER.

If the observer stands facing the barometer the short arm will move to the right as the pressure of the atmosphere or weight of air increases, and to the left as the pressure diminishes. The long arm should be moved so as to coincide with or directly cover the short arm, and the reading of the barometer is obtained by reading from the lowest reading found on outer scale to the division of that scale to which the long arm points or which it covers. The inches and hundredths of inches are marked on the scale. The inches and hundredths are counted from left to right, or in the same direction as the hands of a watch move. The inches and hundredths are written in the same manner as dollars and cents, thus: One dollar and seventy-five cents would be written $1.75, or one and seventy-five-hundredths, $29.35, twenty-nine dollars and thirty-five-hundredths.

The barometer reading 29 inches and thirty-five-hundredths of an inch would be written 29.35 inches, &c.

THERMOMETER.

In reading the thermometer the observer should be careful to place the eye at the same level as the top of the column of mercury, otherwise the reading will not be correct.

WET-BULB THERMOMETER.

A piece of wicking six or eight inches in length should be used with this thermometer, one end being drawn over the bulb until it is entirely covered, and the other

end placed in the cistern which is on the wooden frame. The cistern should be kept filled with pure rain-water at all times when the temperature of the air is above freezing-point, and the cover should be changed once a month and the bulb carefully cleaned. The cover can be kept clean by washing it (without removal) by use of a jet of water thrown from a small syringe.

When the temperature of the air is below the freezing-point the water will be emptied from the cistern and the bulb moistened with water. By watching the mercury in the tube it will be seen to fall for a few minutes and then to rise again. The height of the mercury, or reading of thermometer, when at its lowest point, should be read.

WIND VANE.

The vane used for determining the direction of the wind must be set where the wind will act freely on it, and must never be sheltered by surrounding buildings or other objects.

The direction of wind is indicated by the point of the horizon from which it comes; thus a north wind is one blowing from the north, an east wind is one blowing from the east, a south wind is one blowing from the south, &c. The direction of the wind will be designated by the eight principal points of the compass, N., E., S., W., N. E., S. E., S. W., N. W.

The wind-vane and stand consist of the following parts:

1st. Upright staff about five feet in length, at the lower end of which should be cut a tenon about one inch in length; near upper end are two holes which cross each other at right angles, and through which are passed the iron arms (marked 3), at the ends of which are the letters N. and S. and E. and W. A hole is bored in the *upper* end of staff, in which the slender iron (marked 4) is screwed, and on which the wind-vane (marked 5) is placed.

2d. Four iron braces.

3d. Two iron arms, with letters N. and S. and E. and W. at the ends.

4th. Slender iron rod on which the vane is placed.

5th. Wind-vane.

To place the vane and stand in position, a small platform, about two and a half feet square, should be placed on roof of observer's office and carefully leveled. A hole to receive the tenon at the foot of staff should be cut in center of platform. Draw upon the platform the true meridian line passing through the center, and mark the ends of the line N. and S., respectively.

To determine the true meridian line, place the compass with its center over the center of the hole in the platform; place the eye at south end of needle, and mark on platform a point toward which the north end of needle points; place the eye at north end of needle, and mark the point toward which the south end of needle points. Draw through the points thus determined and the center of platform a line, which will be the magnetic meridian.

The variation of the needle at your station is ° east; that is, the needle points ° east of the true north.

On Plate I will be seen two lines, which cross each other at the point O. One of these lines is marked simply "N." and "S."; the other line is marked "True N." and "True S." Place this plate with the point marked "O" at, center of platform, and so that the line marked "N." and "S." immediately covers the line (or magnetic meridian) which has been marked on platform. Mark on the platform where the line marked "True N." and "True S." reaches edges of plate; a line drawn through these points, and the center of platform, will be the true "N." and "S." line, or true meridian. Paint on the platform a circle (whose center coincides with the center of the platform) having a diameter of about two feet, and on this circle mark the four cardinal points N., E., S., and W., and the four intermediate points N. E., S. E., S. W., and N. W. Unscrew the nuts at ends of iron arms (3); take off the movable letters; pass the rods through the holes drilled near upper end of staff; put on the letters and screw on the nuts. Screw the slender iron rod (4) into the hole in end of staff. Place a screw about six inches above the lower end of staff, and immediately below the end of arm on which the letter N. is placed. Place the tenon at foot of staff in the hole in center of platform, and turn the staff until the screw under letter N. is immediately over the meridian line, the arm with letter N. will be immediately over the end of meridian line (marked "N"), and therefore points to the true north. Place the staff in a vertical position, this being determined by the use of a plumb-line; fasten one end of each of the iron braces (2) to the platform and the other end to the staff, so as to hold the latter firmly in position. Place the wind-vane on the slender rod (4), passing the rod through the hole near center of vane.

In determining the direction of the wind at the time of observation, the division of the circle which most nearly coincides with the direction in which the arrow-head of vane points will be taken as the direction of the wind.

In winds of considerable strength, the vane is never at rest or fixed in the same direction; it oscillates incessantly, and its oscillations increase with the violence of the wind. In such cases observers must note the mean direction between the extremes. When the wind is too light to move the vane, and when it is calm, no direction will be recorded.

RAIN-GAUGE.

The rain-gauge will be placed, whenever practicable, with the top of the funnel-shaped collector twelve inches above the surface of the ground, firmly fixed in a vertical position, and protected from the interference of unauthorized persons. It will be examined at time of making the daily observations, the amount of water it contains carefully measured by means of the graduated rod sent with each gauge, and then emptied and returned to its proper position. When a position at the level of the ground cannot be found with a sufficiently clear exposure, the gauge will be placed on the top of the instrument-room, or roof of the building occupied by the observer, who will measure the height above the ground and report it to this office.

The measuring-rod is graduated in or divided into inches and tenths of inches, and the proportion between the cylinder and funnel is as ten to one, so that ten inches upon the rod corresponds with one inch of actual rain-fall, one inch on the rod to one-tenth of rain, and one-tenth on the rod to one-hundredth of rain. Snow will be melted and then measured, and reported in the same manner as rain, but the fact of its being melted snow must be noted under the head of "remarks" in the weekly reports.

Whenever from any cause the snow cannot be melted, the depth will be measured and ten inches of snow reported as one inch of rain. The rule for determining the amount of rain-fall from the amount of water collected in the tube is as follows, viz:

Measure the amount of water in the tube with the measuring-stick, which is divided into inches and tenths. Divide the amount of water found by ten; the quotient will be the amount of rain-fall.

EXAMPLES.

Amount of water in tube	1.4 inches.
Amount of rain-fall	.14 inch.
Amount of water in tube	15.6 inches.
Amount of rain-fall	1.56 inches.
Amount of water in tube	0.1 inch.
Amount of rain-fall	0.01 inch.

When reports cannot be forwarded on the day on which they are taken, they will not be transmitted by telegraph.

C. E. KILBOURNE,

First Lieutenant Second U. S. Artillery, Acting Signal Officer and Assistant.

Sunset cipher.

CLEAR—NO CLOUDS TO BE SEEN.

Character of sunset.	Wind blowing from the—								
	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	Calm.
Fair	Abase.	Abbey.	Abbott.	Abide.	Able.	About.	Abrupt.	Absent.	Abstract.
Foul	Accede.	Accept.	Accord.	Account.	Accuse.	Ache.	Acorn.	Acquit.	Across.
Doubtful	Adage.	Address.	Adieu.	Adjust.	Admire.	Admit.	Adapt.	Adult.	Advance.

SKY ONE-QUARTER COVERED WITH CLOUDS.

Fair	Babe.	Back.	Bacon.	Baffle.	Bake.	Balance.	Ballot.	Balsam.	Banner.
Foul	Beach.	Beaver.	Beef.	Before.	Beggar.	Begin.	Behave.	Belief.	Bengal.
Doubtful	Bible.	Bidder.	Bilge.	Billion.	Bird.	Birth.	Biscuit.	Bishop.	Bison.

SKY ONE-HALF COVERED WITH CLOUDS.

Fair	Cabin.	Cable.	Cadet.	Cage.	Cake.	Camel.	Camp.	Cane.	Cannon.
Foul	Cease.	Cedar.	Cell.	Cellar.	Cement.	Census.	Cent.	Century.	Certain.
Doubtful	Cigar.	Cinder.	Cipher.	Circle.	Circuit.	Cistern.	Citron.	City.	Civil.

SKY THREE QUARTERS COVERED WITH CLOUDS.

Fair	Dagger.	Daily.	Daisy.	Damage.	Damp.	Damsel.	Dance.	Danger.	Danish.
Foul	Dead.	Debate.	Decay.	Decide.	Deck.	Decline.	Defame.	Default.	Defeat.
Doubtful	Dice.	Differ.	Digest.	Dilate.	Dimly.	Dimple.	Dine.	Dinner.	Dish.

SKY ENTIRELY COVERED WITH CLOUDS.

Fair	Each.	Eager.	Earl.	Earnest.	Ease.	Easter.	Easy.	Eddy.	Effect.
Foul	Elate.	Elder.	Elope.	Embalm.	Embark.	Embrace.	Empire.	Employ.	Express.
Doubtful	Endow.	Endure.	Enemy.	Enforce.	Engage.	Engine.	English.	Enjoy.	Enlist.

RAINING.

Fair	Race.	Raffle.	Rage.	Raise.	Rally.	Ramble.	Rapid.	Rather.	Ration.
Foul	Read.	Reap.	Reason.	Rebel.	Rebuke.	Recess.	Record.	Refine.	Regard.
Doubtful	Ribbon.	Rich.	Riddle.	Riding.	Rifle.	Ring.	Ripe.	Rise.	Rival.

SNOWING.

Fair	Safe.	Sale.	Salmon.	Salute.	Sample.	Sand.	Sash.	Satan.	Sauce.
Foul	Season.	Sedan.	Self.	Sense.	Sentry.	Serpent.	Service.	Session.	Setting.
Doubtful	Sick.	Siege.	Sigh.	Silent.	Silk.	Silver.	Sinful.	Sing.	Sister.

All cipher-words must be written clearly and distinctly.

Barometer—Observed readings.

All cipher-words must be written clearly and distinctly.

16.00 to 16.99.

16.00 Ab	16.25 Abscond	16.50 Acid	16.75 Adeline
.01 Aback	.26 Absence	.51 Acorn	.76 Adieu
.02 Abaft	.27 Absent	.52 Acquaint.	.77 Adjoin
.03 Abandon	.28 Absist	.53 Acquest	.78 Adjourn
.04 Abase	.29 Absorb	.54 Acquire	.79 Adjudge
.05 Abash	.30 Abstain	.55 Acquit	.80 Adjunct
.06 Abator	.31 Abstract	.56 Acre	.81 Adjure
.07 Abbey	.32 Absurd	.57 Across	.82 Adjust
.08 Abbot	.33 Abundant	.58 Acting	.83 Adjutant
.09 Abduct	.34 Abusive	.59 Action	.84 Admiral
.10 Abet	.35 Abyss	.60 Active	.85 Admire
.11 Abhor	.36 Accede	.61 Actress	.86 Admit
.12 Abiding	.37 Accent	.62 Actual	.87 Admonish
.13 Abject	.38 Accept	.63 Acumen	.88 Adore
.14 Abjure	.39 Access	.64 Acute	.89 Adorn
.15 Able	.40 Accident	.65 Adage	.90 Adrift
.16 Abode	.41 Acclaim	.66 Adapt	.91 Adroit
.17 Abolish	.42 Accord	.67 Add	.92 Adult
.18 Abound	.43 Accost	.68 Adder	.93 Advance
.19 About	.44 Account	.69 Addict	.94 Advent
.20 Above	.45 Accrue	.70 Addition	.95 Adventure
.21 Abridge	.46 Accuse	.71 Adding	.96 Adverb
.22 Abroad	.47 Ace	.72 Address	.97 Adverse
.23 Abrupt	.48 Ache	.73 Adduce	.98 Advice
.24 Abscess	.49 Achieve	.74 Adhere	.99 Advocate

17.00 to 17.99.

17.00 Affair	17.25 Agitate	17.50 Alight	17.75 Alpine
.01 Affect	.26 Aglow	.51 Alike	.76 Already
.02 Affiance	.27 Agony	.52 Alive	.77 Also
.03 Affine	.28 Agree	.53 Allay	.78 Altar
.04 Affirm	.29 Ahead	.54 Allege	.79 Alternate
.05 Affix	.30 Aid	.55 Alliance	.80 Although
.06 Afflict	.31 Aiding	.56 Alligator	.81 Alto
.07 Affluent	.32 Ailment	.57 Allot	.82 Alum
.08 Afflux	.33 Aim	.58 Allow	.83 Alvin
.09 Afford	.34 Air	.59 Allowance	.84 Alvord
.10 Affray	.35 Aisle	.60 Allude	.85 Always
.11 Affront	.36 Akin	.61 Allure	.86 Amateur
.12 Affuse	.37 Alarm	.62 Allusion	.87 Amaze
.13 Afraid	.38 Alas	.63 Almanac	.88 Amazon
.14 After	.39 Album	.64 Almond	.89 Amber
.15 Aftward	.40 Alcove	.65 Alms	.90 Ambit
.16 Again	.41 Alder	.66 Aloe	.91 Ambition
.17 Against	.42 Alderman	.67 Aloft	.92 Ambler
.18 Age	.43 Aldine	.68 Alone	.93 Amboy
.19 Agency	.44 Ale	.69 Along	.94 Ambulance
.20 Agent	.45 Alert	.70 Aloof	.95 Ambush
.21 Aggress	.46 Alexis	.71 Aloud	.96 Amen
.22 Aggrieve	.47 Algebra	.72 Alps	.97 Amend
.23 Aghast	.48 Alien	.73 Alpha	.98 America
.24 Agile	.49 Alienate	.74 Alphabet	.99 Amiable

18.00 to 18.99.

18.00 Amid	18.08 Amply	18.16 And	18.24 Ankle
.01 Amidst	.09 Amulet	.17 Anew	.25 Anna
.02 Amiss	.10 Amuse	.18 Angel	.26 Annals
.03 Amity	.11 Amusing	.19 Angelic	.27 Anneal
.04 Amnesty	.12 Amusive	.20 Angle	.28 Annex
.05 Amongst	.13 Ancestor	.21 Angry	.29 Announce
.06 Amount	.14 Anchor	.22 Anguish	.30 Annoy
.07 Ample	.15 Ancient	.23 Animal	.31 Annual

18.32 Annul	18.49 Ape	18.66 Apply	18.83 Arch
.33 Anoint	50 Apish	.67 Appoint	.84 Archer
.34 Another	.51 Apology	.68 Appraise	.85 Archive
.35 Answer	.52 Apostate	.69 Apprise	.86 Ardent
.36 Ant	.53 Apostle	.70 Approach	.87 Argue
.37 Antelope	.54 Apparel	.71 Approval	.88 Argument
.38 Anthem	.55 Apparent	.72 Approve	.89 Arise
.39 Antic	.56 Appeach	.73 Appulse	.90 Ark
.40 Antidote	.57 Appeal	.74 April	.91 Arm
.41 Antique	.58 Appear	.75 Apron	.92 Armada
.42 Antler	.59 Appease	.76 Aptness	.93 Armful
.43 Anvil	.60 Appellant	.77 Arab	.94 Arming
.44 Anxious	.61 Append	.78 Arabic	.95 Armlet
.45 Any	.62 Appendage	.79 Arbiter	.96 Armor
.46 Apace	.63 Applaud	.80 Arbitrate	.97 Armory
.47 Apart	.64 Applause	.81 Arbor	.98 Army
.48 Apathy	.65 Apple	.82 Arcade	.99 Around

19.00 to 19.99.

19.00 Arouse	19.25 Asper	19.50 Astray	19.75 Auger
.01 Arraign	.26 Asperse	.51 Astride	.76 Aught
.02 Arrange	.27 Asphalt	.52 Astute	.77 Augment
.03 Arrant	.28 Aspirant	.53 Asylum	.78 August
.04 Array	.29 Aspire	.54 Athletic	.79 Aurora
.05 Arrest	.30 Assail	.55 Athwart	.80 Author
.06 Arrival	.31 Assassin	.56 Atlas	.81 Autumn
.07 Arrow	.32 Assault	.57 Atom	.82 Avail
.08 Arsenic	.33 Assembly	.58 Atone	.83 Avast
.09 Arson	.34 Assent	.59 Attach	.84 Avaunt
.10 Artful	.35 Assess	.60 Attain	.85 Avenge
.11 Article	.36 Assets	.61 Attempt	.86 Average
.12 Artisan	.37 Assign	.62 Attendance	.87 Avert
.13 Artist	.38 Assist	.63 Attention.	.88 Avoid
.14 Artless	.39 Assistant	.64 Attentive	.89 Avoke
.15 As	.40 Assort	.65 Attest	.90 Avouch
.16 Ascend	.41 Assuage	.66 Attic	.91 Avow
.17 Ascribe	.42 Assume	.67 Attire	.92 Await
.18 Ash	.43 Assure	.68 Attitude	.93 Awaiting
.19 Ashame	.44 Aster	.69 Attorney	.94 Awake
.20 Ashes	.45 Astern	.70 Attract	.95 Away
.21 Ashore	.46 Asthma	.71 Auburn	.96 Awful
.22 Aside	.47 Astonish	.72 Auction	.97 Awhile
.23 Asleep	.48 Astound	.73 Audience	.98 Awning
.24 Aspect	.49 Astral	.74 Audit	.99 Axis

20.00 to 20.99.

20.00 Babble	20.21 Bake	20.42 Bandit	20.63 Baronet
.01 Babe	.22 Baker	.43 Bang	.64 Barouche
.02 Babel	.23 Baking	.44 Banish	.65 Barque
.03 Baboon	.24 Balance	.45 Banjo	.66 Barracks
.04 Bachelor	.25 Balcony	.46 Bank	.67 Barrel
.05 Back	.26 Baleful	.47 Banker	.68 Barren
.06 Backing	.27 Balk	.48 Banking	.69 Barrow
.07 Backward	.28 Balkish	.49 Bankrupt	.70 Barter
.08 Bacon	.29 Balky	.50 Banner	.71 Barton
.09 Bad	.30 Ball	.51 Banquet	.72 Base
.10 Badge	.31 Ballad	.52 Bantam	.73 Baseless
.11 Badly	.32 Ballast	.53 Baptism	.74 Basement
.12 Badness	.33 Ballet	.54 Baptist	.75 Bashful
.13 Baffle	.34 Balloon	.55 Baptize	.76 Basil
.14 Bag	.35 Balloting	.56 Barber	.77 Basin
.15 Baggage	.36 Balm	.57 Bare	.78 Basis
.16 Bagging	.37 Balsam	.58 Bargain	.79 Bask
.17 Bail	.38 Baltic	.59 Barge	.80 Basket
.18 Bailiff	.39 Bamboo	.60 Barley	.81 Bass
.19 Baily	.40 Band	.61 Baron	.82 Bassett
.20 Bain	.41 Bandage	.62 Baroness	.83 Bastard

20.84 Baste	20.88 Batful	20.92 Bathing	20.96 Baxter
.85 Bastile	.89 Batting	.93 Battle	.97 Bay
.86 Bat	.90 Battery	.94 Batton	.98 Bayard
.87 Batch	.91 Bathe	.95 Bauble	.99 Bayonet

21.00 to 21.99.

21.00 Be	21.25 Bedaub	21.50 Beheld	21.75 Benign
.01 Beach	.26 Bedding	.51 Behind	.76 Bennet
.02 Beacon	.27 Bedel	.52 Behold	.77 Benton
.03 Bead	.28 Bedew	.53 Behoof	.78 Benumb
.04 Beadle	.29 Bedim	.54 Behoove	.79 Bequeath
.05 Beak	.30 Bedlam	.55 Being	.80 Bequest
.06 Beam	.31 Beef	.56 Belate	.81 Bereave
.07 Beaming	.32 Beetle	.57 Belch	.82 Bereft
.08 Bear	.33 Befall	.58 Belfry	.83 Berlin
.09 Bearing	.34 Befit	.59 Belief	.84 Berry
.10 Beard	.35 Befoam	.60 Believe	.85 Berth
.11 Bearer	.36 Befool	.61 Belight	.86 Beseech
.12 Beast	.37 Before	.62 Belike	.87 Beset
.13 Beastly	.38 Befoul	.63 Bell	.88 Beside
.14 Beat	.39 Befriend	.64 Bellow	.89 Besiege
.15 Beating	.40 Beget	.65 Belong	.90 Best
.16 Beaufort	.41 Beggar	.66 Belting	.91 Bestain
.17 Beauty	.42 Begild	.67 Bemoan	.92 Bestow
.18 Became	.43 Begin	.68 Bemourn	.93 Bet
.19 Because	.44 Beginner	.69 Bend	.94 Betake
.20 Beck	.45 Begone	.70 Bender	.95 Betide
.21 Beckon	.46 Begrudge	.71 Beneath	.96 Betoken
.22 Becloud	.47 Behalf	.72 Benefit	.97 Betray
.23 Becoming	.48 Behave	.73 Bengal	.98 Betrim
.24 Bed	.49 Behead	.74 Benight	.99 Betroth

22.00 to 22.99.

22.00 Better	22.25 Binacle	22.50 Blend	22.75 Blunder
.01 Betty	.26 Bird	.51 Bless	.76 Blunt
.02 Between	.27 Birthday	.52 Blessing	.77 Blush
.03 Betwixt	.28 Biscay	.53 Blight	.78 Bluster
.04 Bevel	.29 Biscuit	.54 Blind	.79 Boarding
.05 Bevy	.30 Bishop	.55 Blinker	.80 Boastful
.06 Bewail	.31 Bison	.56 Blissful	.81 Boasting
.07 Beware	.32 Bite	.57 Blister	.82 Boatman
.08 Bewilder	.33 Bitten	.58 Blithe	.83 Boatswain
.09 Bewitch	.34 Blab	.59 Blockade	.84 Bobby
.10 Beyond	.35 Black	.60 Blonde	.85 Bobbin
.11 Bias	.36 Blacking	.61 Blood	.86 Bodeful
.12 Bib	.37 Blade	.62 Bloom	.87 Bodkin
.13 Bible	.38 Blame	.63 Blooming	.88 Body
.14 Bicker	.39 Blameful	.64 Blossom	.89 Bogus
.15 Bidder	.40 Blameless	.65 Blot	.90 Boiler
.16 Bidding	.41 Blanche	.66 Blotting	.91 Boiling
.17 Biddy	.42 Blank	.67 Blotch	.92 Bold
.18 Bide	.43 Blanket	.68 Blouse	.93 Boldness
.19 Bilge	.44 Blast	.69 Blow	.94 Bolster
.20 Bilious	.45 Blasting	.70 Blowing	.95 Bolting
.21 Billiards	.46 Bleach	.71 Blown	.96 Bolus
.22 Billion	.47 Bleak	.72 Blubber	.97 Bomb
.23 Billy	.48 Bled	.73 Blue	.98 Bombard
.24 Binding	.49 Blemish	.74 Bluff	.99 Bombast

23.00 to 23.99.

23.00 Bone	23.06 Booming	23.12 Bosom	23.18 Bound
.01 Boneless	.07 Booth	.13 Botts	.19 Bounty
.02 Bonfire	.08 Borax	.14 Bottom	.20 Boquet
.03 Boneset	.09 Border	.15 Bought	.21 Bower
.04 Book	.10 Boring	.16 Boulder	.22 Bowl
.05 Boom	.11 Borough	.17 Bounce	.23 Box

23.24 Boyhood	23.43 Brat	23.62 Bridge	23.81 Brook
.25 Boyish	.44 Brave	.63 Bridle	.82 Broom
.26 Brace	.45 Bravely	.64 Brief	.83 Brother
.27 Bracelet	.46 Bravo	.65 Brigade	.84 Brow
.28 Bracket	.47 Brawl	.66 Brigand	.85 Brown
.29 Brackish	.48 Bray	.67 Bright	.86 Browning
.30 Brad	.49 Breach	.68 Brilliant.	.87 Bruin
.31 Brag	.50 Bread	.69 Brim	.88 Bruise
.32 Braggart	.51 Breast	.70 Brimful	.89 Brushing
.33 Braid	.52 Breathe	.71 Brindle	.90 Brutal
.34 Brainless	.53 Breathing	.72 Brine	.91 Brute
.35 Brake	.54 Breed	.73 Bring	.92 Bryant
.36 Branch	.55 Breeding	.74 Brisk	.93 Bucket
.37 Brand	.56 Breeze	.75 Bristle	.94 Budget
.38 Brandish	.57 Brew	.76 British	.95 Buff
.39 Brandy	.58 Brewing	.77 Broadway	.96 Buffer
.40 Brant	.59 Bribe	.78 Broil	.97 Buffoon
.41 Brash	.60 Brick	.79 Broken	.98 Bugle
.42 Brass	.61 Bride	.80 Bronze	.99 Build

24.00 to 24.99.

24.00 Bulb	24.25 By	24.50 Campbell	24.75 Cap
.01 Bully	.26 Cabbage	.51 Camphor	.76 Capable
.02 Bulrush	.27 Cabin	.52 Camping	.77 Cape
.03 Bump	.28 Cabinet	.53 Can	.78 Caper
.04 Bunch	.29 Cable	.54 Canal	.79 Capital
.05 Bundle	.30 Caboose	.55 Canary	.80 Capstan
.06 Bunting	.31 Cactus	.56 Cancel	.81 Capsule
.07 Buoy	.32 Caddis	.57 Cancer	.82 Captain
.08 Burr	.33 Cadence	.58 Candid	.83 Caption
.09 Burden	.34 Cadet	.59 Candidate	.84 Captive
.10 Bureau	.35 Calf	.60 Candle	.85 Captor
.11 Burglar	.36 Cage	.61 Candor	.86 Capture
.12 Burner	.37 Cajole	.62 Candy	.87 Caravan
.13 Burning	.38 Cake	.63 Cane	.88 Carbine
.14 Burnish	.39 Calk	.64 Canine	.89 Carbon
.15 Burst	.40 Calking	.65 Canister	.90 Carboy
.16 Bush	.41 Call	.66 Canker	.91 Carcass
.17 Bushby	.42 Calling	.67 Cannibal	.92 Card
.18 Business	.43 Calm	.68 Cannon	.93 Cardinal
.19 Bust	.44 Calmness	.69 Cannot	.94 Career
.20 Bustle	.45 Calver	.70 Canoe	.95 Careful
.21 Busy	.46 Cambric	.71 Canopy	.96 Careless
.22 Butcher	.47 Camel	.72 Canteen	.97 Caress
.23 Butler	.48 Camp	.73 Canton	.98 Cargo
.24 Buttress	.49 Campaign	.74 Canvas	.99 Carlin

25.00 to 25.99.

25.00 Carlisle	25.19 Carve	25.38 Caucus	25.57 Ceylon
.01 Carmel	.20 Carver	.39 Caught	.58 Chafe
.02 Carlot	.21 Carving	.40 Cause	.59 Chaff
.03 Carman	.22 Case	.41 Caustic	.60 Chagrin
.04 Carnage	.23 Cash	.42 Caution	.61 Chain
.05 Carnation	.24 Cashier	.43 Cavil	.62 Chairman
.06 Carnival	.25 Casing	.44 Cease	.63 Chaise
.07 Carny	.26 Cass	.45 Cedar	.64 Chaldron
.08 Caroline	.27 Casket	.46 Ceil	.65 Chalk
.09 Caromel	.28 Castigate	.47 Cellar	.66 Challenge
.10 Carouse	.29 Casting	.48 Cement	.67 Chamber
.11 Carpenter	.30 Castle	.49 Censor	.68 Chamois
.12 Carpet	.31 Castrate	.50 Cent	.69 Champion
.13 Carroll	.32 Casual	.51 Centre	.70 Chance
.14 Carson	.33 Cat	.52 Central	.71 Chandler
.15 Cartage	.34 Catch	.53 Century	.72 Change
.16 Carter	.35 Catling	.54 Certain	.73 Channel
.17 Cartoon	.36 Catnip	.55 Certify	.74 Chant
.18 Cartridge	.37 Cattle	.56 Cessant	.75 Chantress

25.76 Chapel	25.82 Charger	25.88 Chasm	25.94 Chaw
.77 Chaplain	.83 Charity	.89 Chaste	.95 Cheap
.78 Chapless	.84 Charm	.90 Chasten	.96 Cheat
.79 Chapman	.85 Charming	.91 Chastise	.97 Check
.80 Chapter	.86 Charter	.92 Chat	.98 Checkless
.81 Charade	.87 Chase	.93 Chattel	.99 Cheerful

26.00 to 26.99.

26.00 Cheese	26.25 Choice	26.50 Clad	26.75 Climb
.01 Chemical	.26 Choke	.51 Claim	.76 Clinch
.02 Chemist	.27 Choose	.52 Claimant	.77 Cling
.03 Cherish	.28 Chorus	.53 Clamor	.78 Clinker
.04 Cherry	.29 Chowder	.54 Clamp	.79 Clip
.05 Cherub	.30 Christian	.55 Clapper	.80 Cloak
.06 Chess	.31 Christmas	.56 Clarence	.81 Clock
.07 Chester	.32 Chronic	.57 Claret	.82 Cloddy
.08 Chestnut	.33 Chronicle	.58 Clash	.83 Close
.09 Chewing	.34 Chub	.59 Classic	.84 Closely
.10 Chicken	.35 Chuckle	.60 Clay	.85 Closet
.11 Chide	.36 Chum	.61 Clean	.86 Closure
.12 Chief	.37 Church	.62 Cleanness	.87 Clothe
.13 Chiefly	.38 Churning	.63 Clearage	.88 Clothing
.14 Chieftain	.39 Cinder	.64 Clearance	.89 Clouds
.15 Child	.40 Cipher	.65 Clearing	.90 Cloudy
.16 Childish	.41 Circle	.66 Clearly	.91 Cloudless
.17 Children	.42 Circuit	.67 Cleaver	.92 Clover
.18 Chill	.43 Circular	.68 Cleft	.93 Clown
.19 Chime	.44 Circus	.69 Clement	.94 Club
.20 Chimney	.45 Cistern	.70 Clergy	.95 Clue
.21 Chink	.46 Citizen	.71 Client	.96 Clumsy
.22 Chip	.47 Citron	.72 Cliff	.97 Cluster
.23 Chipping	.48 City	.73 Climate	.98 Clutch
.24 Chisel	.49 Civilian	.74 Climax	.99 Coach

27.00 to 27.99.

27.00 Coal	27.25 Combat	27.50 Complete	27.75 Condole
.01 Coarse	.26 Combine	.51 Complex	.76 Conduce
.02 Coast	.27 Comedy	.52 Comply	.77 Conduct
.03 Coasting	.28 Comet	.53 Compose	.78 Confer
.04 Coax	.29 Comfit	.54 Compound	.79 Confess
.05 Cobalt	.30 Comfort	.55 Compress	.80 Confide
.06 Cobble	.31 Comma	.56 Comprise	.81 Confidence
.07 Coffee	.32 Command	.57 Compute	.82 Confident
.08 Coffin	.33 Commence	.58 Concave	.83 Confine
.09 Cogent	.34 Commend	.59 Conceal	.84 Confirmed
.10 Coiling	.35 Comment	.60 Concede	.85 Conflict
.11 Colder	.36 Commit	.61 Conceit	.86 Conflux
.12 Collapse	.37 Commode	.62 Conceive	.87 Conform
.13 Collate	.38 Commodore	.63 Concept	.88 Confound
.14 Collect	.39 Common	.64 Concern	.89 Confront
.15 Collector	.40 Commune	.65 Concert	.90 Confuse
.16 College	.41 Commute	.66 Concise	.91 Congress
.17 Colon	.42 Compact	.67 Conclave	.92 Conjure
.18 Colonel	.43 Compare	.68 Conclude	.93 Connect
.19 Colony	.44 Compass	.69 Concord	.94 Connive
.20 Colors	.45 Compel	.70 Concourse	.95 Conquer
.21 Colt	.46 Compete	.71 Concur	.96 Conquest
.22 Columbia	.47 Competent	.72 Condemn	.97 Conscience
.23 Column	.48 Compile	.73 Condense	.98 Conscript
.24 Comb	.49 Complain	.74 Condition	.99 Consent.

28.00 to 28.99.

28.00 Conserve	28.04 Console	28.08 Construct	28.12 Consume
.01 Consider	.05 Conspire	.09 Construe	.13 Contain
.02 Consign	.06 Constant	.10 Consulate	.14 Contempt
.03 Consist	.07 Constrain	.11 Consult	.15 Contend

28.16 Contest	28.37 Coquet	28.58 Cotton	28.79 Cradle
.17 Continent	.38 Coral	.59 Cough	.80 Craft
.18 Continue	.39 Cordage	.60 Could	.81 Cram
.19 Contract	.40 Cordial	.61 Counsel	.82 Cramp
.20 Contrary	.41 Cordon	.62 Count	.83 Crane
.21 Contribute	.42 Cork	.63 Counter	.84 Crank
.22 Contrive	.43 Corn	.64 Countess	.85 Crape
.23 Control	.44 Corner	.65 Country	.86 Crash
.24 Contuse	.45 Cornet	.66 Couple	.87 Crater
.25 Convene	.46 Cornice	.67 Coupling	.88 Cravat
.26 Convert	.47 Corpse	.68 Courage	.89 Craven
.27 Converse	.48 Corrode	.69 Courier	.90 Crazy
.28 Convey	.49 Corrupt	.70 Courting	.91 Cream
.29 Convict	.50 Corsage	.71 Cousin	.92 Creator
.30 Conviction	.51 Corset	.72 Covenant	.93 Creature
.31 Convince	.52 Cortis	.73 Cover	.94 Credence
.32 Convulse	.53 Cosily	.74 Coward	.95 Credible
.33 Copal	.54 Costly	.75 Cox	.96 Credit
.34 Copious	.55 Costume	.76 Coxcomb	.97 Creed
.35 Copper	.56 Cosy	.77 Crab	.98 Creek
.36 Coppy	.57 Cottage	.78 Crack	.99 Creep

29.00 to 29.99.

29.00 Crescent	29.25 Crusade	29.50 Current	29.75 Dandy
.01 Creswell	.26 Crust	.51 Curtail	.76 Danger
.02 Crew	.27 Cry	.52 Curtain	.77 Dark
.03 Cribbage	.28 Crystal	.53 Cushion	.78 Darkness
.04 Cricket	.29 Cuban	.54 Custard	.79 Darling
.05 Crime	.30 Cube	.55 Custer	.80 Dash
.06 Criminal	.31 Cubic	.56 Custody	.81 Dastard
.07 Crimson	.32 Cuckoo	.57 Custom	.82 Date
.08 Cripple	.33 Cudgel	.58 Customer	.83 Daub
.09 Crisis	.34 Cuff	.59 Cutlas	.84 Daughter
.10 Crisp	.35 Cullis	.60 Cutter	.85 Daunt
.11 Crispin	.36 Cully	.61 Cutting	.86 David
.12 Critic	.37 Culprit	.62 Dabble	.87 Dawn
.13 Crook	.38 Culture	.63 Dagger	.88 Dayton
.14 Cross	.39 Cumber	.64 Dahlia	.89 Deacon
.15 Cr ton	.40 Cunning	.65 Daily	.90 Dead
.16 Crouch	.41 Cupid	.66 Dainty	.91 Deaf
.17 Croup	.42 Cupola	.67 Dairy	.92 Deal
.18 Crowd	.43 Cupping	.68 Damage	.93 Death
.19 Crowing	.44 Curdless	.69 Damask	.94 Debase
.20 Crown	.45 Cure	.70 Damp	.95 Debt
.21 Crude	.46 Curious	.71 Damper	.96 Decay
.22 Cruel	.47 Curl	.72 Damsel	.97 Decent
.23 Cruise	.48 Curlew	.73 Dance	.98 Decide
.24 Crumb	.49 Curling	.74 Dander	.99 Decline

30.00 to 30.99.

30.00 Deduct	30.18 Demand	30.36 Destine	30.54 Dipper
.01 Deep	.19 Demon	.37 Destroy	.55 Discount
.02 Defame	.20 Demur	.38 Detach	.56 Discuss
.03 Default	.21 Dent	.39 Detest	.57 Disgrace
.04 Defeat	.22 Deny	.40 Devote	.58 Disgust
.05 Defect	.23 Depart	.41 Devour	.59 Dismay
.06 Defend	.24 Depend	.42 Dew	.60 Dismiss
.07 Defence	.25 Deplore	.43 Dexter	.61 Disown
.08 Define	.26 Deploy	.44 Differ	.62 Dispatch
.09 Defraud	.27 Depose	.45 Diffuse	.63 Display
.10 Defray	.28 Depot	.46 Digest	.64 Dispose
.11 Defy	.29 Depress	.47 Dilate	.65 Dispute
.12 Degree	.30 Deprive	.48 Dilute	.66 Distance
.13 Deject	.31 Desert	.49 Dime	.67 Disturb
.14 Delay	.32 Design	.50 Dimple	.68 Disuse
.15 Delight	.33 Desire	.51 Dine	.69 Divert
.16 Delude	.34 Desk	.52 Dinner	.70 Divide
.17 Deluge	.35 Despot	.53 Dip	.71 Dock

30.72 Doctor	30.79 Draft	30.86 Drink	30.93 Dungeon
.73 Dog	.80 Dragon	.87 Drive	.94 Dunning
.74 Dollar	.81 Drain	.88 Drop	.95 Dupe
.75 Donkey	.82 Draw	.89 Drum	.96 Durance
.76 Doom	.83 Dream	.90 Duel	.97 Duress
.77 Door	.84 Dress	.91 Dull	.98 Dust
.78 Doubt	.85 Drill	.92 Dumpy	.99 Duty

Dry-bulb thermometer.

—50° to —1°.

—50 Fable	—37 Failing	—24 Fallen	—12 Fantom
—49 Fabric	—36 Failure	—23 False	—11 Farce
—48 Face	—35 Faint	—22 Falsify	—10 Fare
—47 Facial	—34 Faintness	—21 Falter	— 9 Farmer
—46 Facing	—33 Fainty	—20 Fame	— 8 Farming
—45 Fact	—32 Fair	—19 Family	— 7 Faro
—44 Faction	—31 Fairness	—18 Famish	— 6 Farthing
—43 Factious	—30 Faith	—17 Famous	— 5 Fashion
—42 Factor	—29 Faithful	—16 Fan	— 4 Fast
—41 Fade	—28 Faithless	—15 Fanatic	— 3 Fatal
—40 Fading	—27 Falcon	—14 Fancy	— 2 Father
—39 Fagot	—26 Fall	—13 Fang	— 1 Fathom
—38 Fail	—25 Fallacy		

Dry-bulb thermometer.

0° to 31°	32° to 63°	64° to 95°	96° to 125°
0 Fear	32 Fester	64 Finding	96 Flea
1 Fearful	33 Festive	65 Finely	97 Fleet
2 Fearless	34 Festoon	66 Finger	98 Flesh
3 Feast	35 Fetid	67 Finish	99 Flight
4 Feat	36 Fetter	68 Finless	100 Flinch
5 Feather	37 Feudal	69 Finny	101 Fling
6 Feature	38 Fever	70 Fire	102 Flint
7 Federal	39 Few	71 Firm	103 Float
8 Fee	40 Fib	72 Firmly	104 Flood
9 Feeble	41 Fiber	73 Firmness	105 Flower
10 Feebly	42 Fickle	74 First	106 Fluid
11 Feed	43 Fiction	75 Fiscal	107 Flute
12 Feeding	44 Fiddle	76 Fish	108 Fly
13 Feign	45 Fidget	77 Fisher	109 Foam
14 Fellow	46 Field	78 Fit	110 Focus
15 Felon	47 Fife	79 Fitful	111 Fodder
16 Felony	48 Fifth	80 Fitness	112 Fold
17 Felting	49 Fig	81 Fitting	113 Folks
18 Female	50 Fight	82 Fix	114 Follow
19 Feminine	51 Figure	83 Fixture	115 Folly
20 Fence	52 Filbert	84 Flag	116 Fondly
21 Fencing	53 Filch	85 Flagrant	117 Fop
22 Fender	54 File	86 Flail	118 Forage
23 Fennel	55 Fillet	87 Flake	119 Forbid
24 Ferment	56 Film	88 Flank	120 Forest
25 Fern	57 Filter	89 Flap	121 Forget
26 Ferret	58 Filth	90 Flash	122 Forgive
27 Ferry	59 Fin	91 Flatly	123 Formal
28 Fertile	60 Final	92 Flatter	124 Forth
29 Ferule	61 Finance	93 Flaunt	125 Fortune.
30 Fervent	62 Finch	94 Flavor	
31 Fervid	63 Find	95 Flaw	

Wet-bulb thermometer.

—50° to —38°		—37° to —25°	
—50 Fable	—43 Factious	—37 Failing	—30 Faith
—49 Fabric	—42 Factor	—36 Failure	—29 Faithful
—48 Face	—41 Fade	—35 Faint	—28 Faithless
—47 Facial	—40 Fading	—34 Faintness	—27 Falcon
—46 Facing	—39 Fagot	—33 Fainty	—26 Fall
—45 Fact	—38 Fail	—32 Fair	—25 Fallacy
—44 Faction		—31 Fairness	

—24° to —12°.		—11° to —1°.	
—24 Fallen	—17 Famous	—11 Farce	— 4 Fast
—23 False	—16 Fan	—10 Fare	— 3 Fatal
—22 Falsify	—15 Fanatic	— 9 Farmer	— 2 Father
—21 Falter	—14 Fancy	— 8 Farming	— 1 Fathom.
—20 Fame	—13 Fang	— 7 Faro	
—19 Family	—12 Fantom	— 6 Farthing	
—18 Famish		— 5 Fashion	

Wet-bulb thermometer.

0° to 31°.	32° to 63°.	64° to 94°.	95° to 125°.
0 Fear	32 Fester	64 Finding	95 Flaw
1 Fearful	33 Festive	65 Finley	96 Flea
2 Fearless	34 Festoon	66 Finger	97 Fleet
3 Feast	35 Fetid	67 Finish	98 Flesh
4 Feat	36 Fetter	68 Finless.	99 Flight
5 Feather	37 Feudal	69 Finny	100 Flinch
6 Feature	38 Fever	70 Fire	101 Fling
7 Federal	39 Few	71 Firm	102 Flint
8 Fee	40 Fib	72 Firmly	103 Float
9 Feeble	41 Fibre	73 Firmness	104 Flood
10 Feebly	42 Fickle	74 First	105 Flower
11 Feed	43 Fiction	75 Fiscal	106 Fluid
12 Feeding	44 Fiddle	76 Fish	107 Flute
13 Feign	45 Fidget	77 Fisher	108 Fly
14 Fellow	46 Field	78 Fit	109 Foam
15 Felon	47 Fife	79 Fitful	110 Focus
16 Felony	48 Fifth	80 Fitness	111 Fodder
17 Felting	49 Fig	81 Fitting	112 Fold
18 Female	50 Fight	82 Fix	113 Folks
19 Feminine	51 Figure	83 Fixture	114 Follow
20 Fence	52 Filbert	84 Flag	115 Folly
21 Fencing	53 Filch	85 Flagrant	116 Fondly
22 Fender	54 File	86 Flail	117 Fop
23 Fennel	55 Fillet	87 Flake	118 Forage
24 Ferment	56 Film	88 Flank	119 Forbid
25 Fern	57 Filter	89 Flap	120 Forest
26 Ferret	58 Filth	90 Flash.	121 Forget
27 Ferry	59 Fin	91 Flatly	122 Forgive
28 Fertile	60 Final	92 Flatter	123 Formal
29 Ferule	61 Finance	93 Flaunt	124 Forth
30 Fervent	62 Finch	94 Flavor	125 Fortune.
31 Fervid	63 Find		

Rain-fall since last report.

.01 to .25 inches.	.26 to .50 inches.	.51 to .75 inches.	.76 to .99 inches.
.01 Rabbit	.26 Rain	.51 Rapid	.76 Ream
.02 Rabble	.27 Rainbow	.52 Rapine	.77 Reap
.03 Raccoon	.28 Rainless	.53 Rapture	.78 Rear
.04 Race	.29 Rainy	.54 Rascal	.79 Reason
.05 Racer	.30 Raise	.55 Rash	.80 Rebate
.06 Rack	.31 Raisin	.56 Rashly	.81 Rebel
.07 Racket	.32 Rake	.57 Rashness	.82 Rebound
.08 Racy	.33 Raking	.58 Rat	.83 Rebuff
.09 Raddock	.34 Rally	.59 Rather	.84 Rebuild
.10 Radiant	.35 Ramage	.60 Ratify	.85 Rebuke
.11 Radiate	.36 Ramble	.61 Ratio	.86 Rebut
.12 Radical	.37 Rampage	.62 Ration	.87 Recall
.13 Radish	.38 Rampant	.63 Rattle	.88 Recast
.14 Radius	.39 Ramrod	.64 Ravage	.89 Recede
.15 Raffle	.40 Ramson	.65 Ravel	.90 Receipt
.16 Raft	.41 Ranche	.66 Raven	.91 Receive
.17 Rafting	.42 Rancid	.67 Ravish	.92 Recent
.18 Rag	.43 Rancor	.68 Rawley	.93 Reception
.19 Rage	.44 Random	.69 Raymond	.94 Recess
.20 Rageful	.45 Range	.70 Razor	.95 Rechange
.21 Ragged	.46 Ranger	.71 Reaching	.96 Recite
.22 Ragman	.47 Rank	.72 Read	.97 Reckless
.23 Raid	.48 Rankness	.73 Reading	.98 Reckon
.24 Rail	.49 Ransack	.74 Ready	.99 Reclaim.
.25 Railing	.50 Rap	.75 Really	

Rain-fall since last report.

1.00 to 1.24 inches.	1.25 to 1.49 inches.	1.50 to 1.74 inches.	1.75 to 1.99 inches.
1.00 Reclasp	.25 Refine	.50 Regular	.75 Reluctant
.01 Recline	.26 Refit	.51 Regulate	.76 Rely
.02 Reclining	.27 Reflect	.52 Rehash	.77 Remade
.03 Recluse	.28 Refloat	.53 Rehearse	.78 Remain
.04 Recoil	.29 Reflux	.54 Reject	.79 Remake
.05 Record	.30 Refold	.55 Rejoice	.80 Remand
.06 Recount	.31 Reforge	.56 Rejoin	.81 Remark
.07 Recourse	.32 Reform	.57 Rejudge	.82 Remedy
.08 Recovery	.33 Refrain	.58 Relapse	.83 Remember
.09 Recruit	.34 Refresh	.59 Relate	.84 Reminder
.10 Rector	.35 Refuge	.60 Relation	.85 Remiss
.11 Recur	.36 Refund	.61 Relative	.86 Remit
.12 Recusant	.37 Refusal	.62 Relator	.87 Remnant
.13 Red	.38 Refuse	.63 Relax	.88 Remodel
.14 Redden	.39 Refute	.64 Relaying	.89 Remold
.15 Redeem	.40 Regain	.65 Release	.90 Remorse
.16 Redoubt	.41 Regal	.66 Relent	.91 Remote
.17 Redound	.42 Regard	.67 Relenting	.92 Remotely
.18 Redraw	.43 Regatta	.68 Reliance	.93 Remount
.19 Redress	.44 Regent	.69 Relic	.94 Removal
.20 Reduce	.45 Regimeut	.70 Relief	.95 Remove
.21 Reed	.46 Region	.71 Relieve	.96 Render
.22 Reef	.47 Register	.72 Religion	.97 Renerve
.23 Refer	.48 Regrade	.73 Relish	.98 Renew
.24 Refill	.49 Regret	.74 Reload	.99 Rennet

Rain-fall since last report.

2.00 to 2.24 inches.	2.25 to 2.74 inches.	2.50 to 2.74 inches.	2.75 to 2.99 inches.
2.00 Renown	.25 Reprieve	.50 Resort	.75 Retrench
.01 Rent	.26 Reprint	.51 Resound	.76 Retrieve
.02 Rental	.27 Reproach	.52 Resource	.77 Return
.03 Replace	.28 Reproof	.53 Respect	78. Reunion
.04 Repack	.29 Reprove	.54 Respite	.79 Reveal
.05 Repaint	.30 Reptile	.55 Respond	.80 Revenge
.06 Repair	.31 Repugn	.56 Response	.81 Revenue
.07 Repast	.32 Repulse	.57 Rest	.82 Reverse
.08 Repay	.33 Repute	.58 Restful	.83 Revert
.09 Repeal	.34 Request	.59 Resting	.84 Review
.10 Repeater	.35 Require	.60 Restless	.85 Revince
.11 Repel	.36 Rescind	.61 Restore	.86 Revise
.12 Repent	.37 Rescue	.62 Restrain	.87 Revival
.13 Repine	.38 Research	.63 Restrict	.88 Revive
.14 Replace	.39 Rescend	.64 Result	.89 Revoke
.15 Replant	.40 Reserve	.65 Resume	.90 Revolt
.16 Replete	.41 Reset	.66 Retail	.91 Revolve
.17 Repleven	.42 Reship	.67 Retainer	.92 Rewake
.18 Replevy	.43 Reside	.68 Retake	.93 Reward
.19 Replunge	.44 Resident	.69 Retard	.94 Rhubarb
.20 Reply	.45 Resign	.70 Retire	.95 Ribbon
.21 Report	.46 Resin	.71 Retort	.96 Rich
22 Reposal	.47 Resist	.72 Retouch	.97 Richly
.23 Repose	.48 Resolute	.73 Retrace	.98 Richness
.24 Repress	.49 Resolve	.74 Retreat	.99 Rickets

Rain-fall since last report.

3.00 to 3.49 inches.	3.00 to 3.49 inches.	3.50 to 4.00 inches.	3.50 to 4.00 inches.
3.00 Riddance	3.25 Roach	3.50 Ross	3.75 Rudder
.01 Riddle	.26 Roadway	.51 Roster	.76 Rude
.02 Ride	.27 Roaming	.52 Rostrum	.77 Rudeness
.03 Ridge	.28 Roars	.53 Rosy	.78 Ruffian
.04 Riding	.29 Roast	.54 Rotary	.79 Rufus
.05 Rife	.30 Roasting	.55 Rotate	.80 Rugged
.06 Rifle	.31 Robbery	.56 Rotten	.81 Ruinous
.07 Riggs	.32 Robin	.57 Rotunda	.82 Rule
.08 Rigging	.33 Robe	.58 Rough	.83 Ruling
.09 Right	.34 Robert	.59 Roughly	.84 Rummage
.10 Rightful	.35 Robust	.60 Round	.85 Rumor
.11 Rigid	.36 Rocky	.61 Rouse	.86 Rumpus
.12 Rigor	.37 Roddy	.62 Rousing	.87 Run
.13 Rimple	.38 Rogers	.63 Route	.88 Running
.14 Ring	.39 Rogue	.64 Routine	.89 Ruption
.15 Ringlet	.40 Roll	.65 Roving	.90 Rural
.16 Rinse	.41 Rolling	.66 Row	.91 Rusking
.17 Riot	.42 Roman	.67 Rowdy	.92 Russell
.18 Ripen	.43 Romance	.68 Royal	.93 Russia
.19 Ripley	.44 Roof	.69 Rub	.94 Rust
.20 Ripple	.45 Root	.70 Rubbage	.95 Rustic
.21 Rise	.46 Rope	.71 Rubber	.96 Rusty
.22 Risk	.47 Rosary	.72 Rubbing	.97 Ruth
.23 Rival	.48 Rosette	.73 Rubbish	.98 Rutland
.24 River	.49 Rosland	.74 Ruby	.99 Rutter

4.00 Rutledge

23 S O

Meteorological record for the week ending ——, 187–.

WAR DEPARTMENT, SIGNAL SERVICE, UNITED STATES ARMY, DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

Day and date of observation.	Time of observation.	Aneroid barometer.	Thermometers.		Wind.		Amount of clouds (in fourths).	Rain or snow.		Amount of rain or melted snow, in inches and hundredths of an inch.	State of weather.	Remarks.
			Dry-bulb.	Wet-bulb.	Direction.	Velocity per hour.*		Commenced.	Ended.			
Sunday—p. m												
Monday—p. m												
Tuesday—p. m												
Wednesday—p. m												
Thursday—p. m												
Friday—p. m												
Saturday—p. m												

* Velocity of wind estimated from signal service scale.

SUNSET STATION, —— ——.

SIGNAL SERVICE SCALE.

0	Calm.
1 to 2 miles per hour	Light wind.
3 to 5 miles per hour	Gentle wind.
6 to 14 miles per hour	Fresh wind.
15 to 29 miles per hour	Brisk wind.
30 to 39 miles per hour	High wind.
40 to 59 miles per hour	Gale.
60 to 79 miles per hour	Storm.
80 miles per hour and above	Hurricane.

——, ——,
Sunset Observer.

[Form Y.]

Report for month ending ———, 187–.

SUNSET PREDICTIONS.

OFFICE SIGNAL SERVICE OBSERVER.

Date. 187 .	Prediction.	Report correct.	Remarks.
1.	Fair.	No.	
2.	Fair.	Yes.	Heavy rain 8.30 a. m. to 4 p. m. Am't .31 inch.
3.	Doubtful.	.....	
4.	Foul.	No.	
5.	Foul.	Yes.	Fair weather all day.
6.			
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PAPER 24.

S. S. ——.

Bulletin for the —— half of the month of ——, 18—, of simultaneous international meteorological observations.

[Taken each day at 7.35 a. m., Washington mean time (4ʰ 57ᵐ p. m., Greenwich mean time).]

Day.	Station. (Harbor or latitude and longitude.)	Barometer. —— feet above sea-level.	Attached thermometer.	Temperature. (Fahrenheit.)		Wind.		Clouds.		Rain-fall in last 24 hours.	Sea-swell.		Weather.	Ship's course and distance sailed since last report.	Signature of observer.
				Dry bulb.	Wet bulb.	Direction.	Force.	Amount.	Direction.		Character.	Direction from which coming.			

Notes on back of blank form.

1. These observations must be taken and recorded each day without fail at the precise hour, 7.35 a. m., Washington mean time (43′ p. m. Greenwich mean time).

2. The *mercurial barometer* is to be used when possible. When the *aneroid barometer* is used, as, for instance, on account of the ship's motion, a letter (*a*) is to be placed after the reading. The aneroid is to be regulated at all times by the mercurial barometer.

3. When, from stress of weather or other causes, all the observations cannot be made, part of them must be invariably given. For instance, if it is not possible to say more than "violent gale," let that be said.

4. The *direction of the wind* is to be given by compass point (corrected for variation) as close as possible. *Wind force* may be given by Beaufort scale of numbers 0 to 12, or in velocity of miles per hour or pressure per square foot, where there are anemometers.

5. One of these blanks, filled out for the first fifteen days of the month, to be mailed on the fifteenth day of each month, or as soon thereafter as practicable, and one filled for the remaining days of the month, to be mailed on the first day of the month, or as soon thereafter as practicable, addressed to the Chief Signal-Officer of the Army, Washington, D. C. Duplicates will be retained until the end of the quarter, when it is desired they also be sent to the Chief Signal-Officer of the Army, Washington, D. C.

6. In taking the readings of the *mercurial barometer* for the international simultaneous reports, the reading of the *attached thermometer* will, in all instances, be taken. This reading will be written on the form in the column for attached thermometers.

7. All expenses of postage, &c., necessary for the proper preservation and forwarding of these reports will be borne by this office.

It is requested the above directions be strictly complied with.

ALBERT J. MYER,
Brig. Gen (Brevet Assigned), Chief Signal-Officer, U. S. A.

NOTE.—A brief account of any remarkable storm may be indorsed hereon below.

(Indorsement:) S. S. ———. Bulletin of simultaneous international meteorological observations for the ——— half of ———, 18—. Respectfully forwarded to the Chief Signal-Officer of the Army. ——— ———, Commanding.

PAPER 25.

Bulletin of international meteorological observations, taken simultaneously on April 26, 1877.

7.35 a. m., Washington mean time.
6.7 a. m., Mexico mean time.
7.7 a. m., San José mean time.
7.25 a. m., Toronto mean time.
0.6 p. m., Lisbon mean time.
0.28 p. m., Madrid mean time.
0.43 p. m., Greenwich mean time.

0.53 p. m., Paris mean time.
1.1 p. m., Brussels mean time.
1.4 p. m., Utrecht mean time.
1.13 p. m., Berne mean time.
1.26 p. m., Christiana mean time.
1.33 p. m., Copenhagen mean time.

1.33 p. m., Rome mean time.
1.37 p. m., Berlin mean time.
1.49 p. m., Vienna mean time.
1.53 p. m., Stockholm mean time.
2.18 p. m., Athens mean time.
2.39 p. m., Constantinople mean time.

2.44 p. m., St. Petersburg mean time.
4.33 p. m., Mauritius mean time.
6.36 p. m., Calcutta mean time.
8.49 p. m., Zi-ka-wei mean time.
10.2 p. m., Tokio (Yeddo), mean time.
10.23 p. m., Melbourne mean time.

ALGERIAN SERIES.

[Furnished by the co-operation of General Teissier, commandant supérieur du génie in Algeria.]

Stations.	Barometer.				Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rain-fall or melted snow in the past 24 hours.		Weather.	Observer.
	Corrected for instrumental error and temperature.		Reduced to sea-level.					Direction.	Velocity.		Force.	Amount.		Direction.					
	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	Upper. 0—10.	Lower. 0—10.	Upper. From—	Lowet. From—	Inches.	Millimeters.		
Nemours	.....	.....	29.97	761.1	68.0	20.0	64	N.	.....	.....	1	.....	1	.....	.....	0	0	Clear	Michel.
Algiers	.....	.....	29.84	758.0	70.2	21.2	57	NW.	.....	.....	2	.....	0	.....	.....	0	0	Clear	Peter.
La Calle	.....	.....	29.81	757.1	61.5	16.4	77	NW.	.....	.....	3	.....	8	.....	.....	0.079	2.0	Cloudy	Fleury.
Tunis	.....	.....	29.80	757.0	72.3	22.4	...	SW.	.....	.....	3	.....	3	.....	.....	0	0	Fair	Jacques.
Sfax	.....	.....	29.79	756.6	68.2	20.1	...	ENE.	.....	.....	3	.....	3	.....	.....	0	0	Fair	Husson.
Saida	.....	.....	29.94	760.4	68.0	20.0	...	WNW.	.....	.....	2	.....	2	.....	.....	0	0	Clear	Millot.
Tebessa	.....	.....	29.82	757.5	64.6	18.1	...	E.	.....	.....	2	.....	10	.....	.....	Inap.	Inap.	Hidden	Bourgeois.
Geriville	.....	.....	29.98	761.4	66.4	19.1	31	NW.	.....	.....	2	.....	1	.....	.....	0	0	Clear	Lemaillot.
Leghouat	.....	.....	29.96	761.0	73.6	23.1	37	W.	.....	.....	2	.....	0	.....	.....	0	0	Clear	Guyot.
Biskra	.....	.....	29.88	759.0	83.3	28.5	26	NW.	.....	.....	4	.....	5	.....	.....	0	0	Fair	Kunts.

NOTE.—In the originals the distinction between the amount of upper and lower clouds is apparently not made. The weather is published as given. The rain-fall is measured at 7 a. m., local time. The elevation of Saida is 890† meters, or 2,919.9† feet; Tebessa, 1,088† m., or 3,569.4† feet; Geriville, 1,360† m., or 4,461.7† feet.

AUSTRIAN SERIES.

[Furnished by the co-operation of Prof. Dr. Julius Hann, director of the Imperial and Royal Central Meteorological Institute at Vienna.]

Agram	.....	.....	29.89	759.2	61.5	16.4	51	NE.	.....	.....	3	.....	4	.....	.....	0	0	.....	Prof. Ivan Stozir.
Cracow (I. R. Observatory)	.....	.....	29.97	761.2	46.8	8.2	64	W.	.....	.....	2	.....	8	.....	.....	0	0	.....	Dr. Wierzbiski.
Eperies	.....	.....	29.90	759.4	46.2	7.9	57	N.	.....	.....	2	.....	9k,s	.....	.....	0	0	.....	Julius Mikolik.
Gratz	28.65	727.7	29.90	759.4	55.6	13.1	52	NE.	.....	.....	2	.....	6	.....	.....	0	0	.....	Andreas Rospini.
Hermannstadt	28.43	722.0	29.86	758.5	45.3	7.4	89	NNE.	.....	.....	1	.....	10	.....	.....	0.264	6.7	.....	Prof. Reissenberger.
Kremsmünster	28.53	724.7	29.87	758.8	50.7	10.4	54	NE.	.....	.....	1	.....	1	.....	.....	0	0	.....	Prof. C. Wagner.
Lemberg	.....	.....	29.87	758.2	45.3	7.4	66	NE.	.....	.....	2	.....	8	.....	.....	0	0	.....	Dr. T. Stanecki.
Nyiregyhaza	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Habzsuda Daniel.
Pola	.....	.....	29.88	758.9	59.9	15.5	59	WNW.	.....	.....	2	.....	2k,s	.....	.....	0	0	.....	I.R. Hydrographic Office.
Szegedin	.....	.....	29.89	759.2	54.5	12.5	67	Calm.	.....	.....	0	.....	4	.....	.....	0	0	.....	Karl Stancel.
Trieste	.....	.....	29.90	759.4	57.9	14.4	70	Calm.	.....	.....	0	.....	1	.....	.....	0	0	Clear	P. Busin.
Vienna	.....	.....	29.93	760.1	51.4	10.8	51	NE.	.....	.....	1	.....	7	.....	.....	0	0	.....	I. R. Central Met. Obs'y.

NOTE.—The originals give, occasionally, the weather by the Vienna symbols or in general terms, and it is not always certain that they refer to the exact moment of observation. The distinction between upper and lower clouds is not made. At Lemberg the rain-fall is measured at 7 p. m., local time. The elevation of Gratz is 343.5 meters, or 1,126.9 feet; Hermannstadt, 407.8 m., or 1,337.9 feet; Kremsmünster, 383.6 m., or 1,258.5 feet. At Eperies the observations have been taken at 2.0 instead of 2.8 p. m.; Gratz at 2.0 instead of 1.45 p. m., local time.

BELGIAN SERIES.

[Furnished by the co-operation of J. C. Honzeau, director of the Royal Observatory at Brussels.]

Arlon	.....	.....	28.89	759.3	52.3	11.3	48	WNW.	.....	.....	2	.....	3	.....	.....	0	0	.....	Royal Observatory.
Brussels	.....	.....	29.94	760.4	51.1	10.6	52	ENE.	.....	.....	2	.....	9k	.....	E.	0	0	.....	
Furnes	.....	.....	29.93	760.3	51.8	11.0	66	ENE.	.....	.....	3	.....	8	.....	.....	0	0	.....	
Maeseyck	.....	.....	29.95	760.7	47.7	8.7	63	NE.	.....	.....	7	.....	2	.....	.....	0	0	.....	

NOTE.—In the originals the weather is occasionally given in general notes for Brussels. Except for Brussels, the distinction between upper and lower clouds is not made. The elevation of Arlon is 418 meters, or 1,371.4 feet.

BRITISH SERIES.

[Furnished by the co operation of Robert H. Scott, esq., director of the Meteorological Office, London, Alexander Buchan, secretary of the Scottish Meteorological Society, Edinburgh, and the respective observers.]

Aberdeen	.....	.....	30.18	766.6	43.2	6.2	...	ESE.	15	6.7	....	.....	3	.....	.....	0	0	Blue sky....	William Boswell.
Ardrossan	.....	.....	30.06	763.5	46	7.8	....	ENE.	.....	.....	4	.....	8	.....	.....	.....	.....	Overcast....	William McNeil.
Armagh (Observatory)	.....	.....	29.99	761.7	44.0	6.7	....	ESE.	20	8.9	....	.....	10	.....	.....	.....	.....	Overcast....	S. Call, for Dr. Robinson.
Bidston (Liverpool Obs'y)	.....	.....	29.97	761.2	44.7	7.1	....	E.	21	9.4	....	.....	10	.....	.....	.....	.....	Overcast....	John Hartnup.
Birr Castle (Parsonstown)	.....	.....	29.85	758.2	46.8	8.2	....	ESE.	.....	.....	3	.....	10	.....	.....	.....	.....	Overcast....	J. Dreyer.

Bulletin of international observations, taken simultaneously on April 26, 1877—Continued.

BRITISH SERIES—Continued.

Stations.	Barometer.				Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rain-fall or melted snow in the past 24 hours.		Weather.	Observer.
	Corrected for instrumental error and temperature.		Reduced to sea-level.					Direction.	Velocity.		Force.	Amount.		Direction.					
	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	Upper. 0—10.	Lower. 0—10.	Upper. From—	Lower. From—	Inches.	Millimeters.		
Bradford (Yorkshire)	.....	.....	30.03	762.7	42.1	5.6	....	E.	.....	.....	2	.....	10	.....	.....	0	0	Overcast	J. McLandsborough.
Bridgetown, Barbados	.....	.....	30.00	762.0	85.0	29.4	....	E.	.....	.....	2	.....	3	.....	.....	.....	.....	D. clouds	Private G. W. Roberts, A. H. C.
Cambridge (Observatory)	.....	.....	29.99	761.5	48.9	9.4	....	E.	.....	.....	1	.....	10	.....	.....	.....	.....	Overcast	H. Todd.
Cardington	.....	.....	29.98	761.5	48.6	9.2	....	E.	.....	.....	1	.....	10	.....	.....	.....	.....	Overcast	John McLaren.
Chatham (School M. E.)	.....	.....	29.98	761.5	48.2	9.0	....	NE.	.....	.....	3	.....	10	.....	.....	.....	.....	D. clouds	Captain Fellowes, R. E.
Dartmoor	28.43	722.1	29.92	760.0	46.0	7.8	....	E.	.....	.....	6	.....	6	.....	.....	.....	.....	D. clouds	Alexander Watt.
Davos Platz, Switzerland	.....	.....	.....	.....	.....	.....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Francis Redford, M. A.
Donaghadee	.....	.....	30.01	762.2	47	8.3	....	SE.	.....	.....	5	.....	7	.....	.....	.....	.....	D. clouds	J. Mac Gowan.
Dover	.....	.....	29.96	761.0	49	9.4	....	E.	.....	.....	3	.....	5	.....	.....	.....	.....	½ clouded	J. Costello.
Eccles (near Manchester)	.....	.....	29.98	761.5	45.0	7.2	....	E.	1.0	0.4	....	.....	10	.....	.....	.....	.....	Gloomy	Thomas Mackareth.
Falmouth (Observatory)	.....	.....	29.82	757.4	50.6	10.3	....	ESE.	.....	.....	6	.....	7	.....	.....	.....	.....	Squally	The Staff.
Fort Napier, Natal	27.80	706.1	30.04	763.0	65.3	18.5	....	NE.	.....	.....	2	.....	0	.....	.....	.....	.....	Blue sky	P'vt. G. Salmon, A. H. C.
Free Town, Sierre Leone	.....	.....	29.96	761.0	88.0	31.1	....	N.	.....	.....	3	.....	3	.....	.....	.....	.....	D. clouds	.....
Galway (Queen's College)	.....	.....	29.76	755.9	47	8.3	....	E.	.....	.....	6	.....	10	.....	.....	.....	.....	Gloomy	B. G. Clare for Professor Curtis.
Gibraltar (Mediterranean)	.....	.....	29.94	760.5	69.7	20.9	....	W.	.....	.....	1	.....	1	.....	.....	.....	.....	D. clouds	Corp'l C. Aitken, A. H. C.
Glasgow (Observatory)	.....	.....	30.07	763.8	42.9	6.1	....	NE.	.....	.....	2	.....	10	.....	.....	.....	.....	Overcast	Lewis Stuart.
Great Yarmouth	.....	.....	30.01	762.2	45	7.2	....	E.	.....	.....	3	.....	4	.....	.....	.....	.....	D. clouds	G. T. Watson.
Greenwich (Royal Obs'y)	.....	.....	29.97	761.2	47.7	8.7	....	E.	.....	.....	2	.....	10	.....	.....	Blank	Blank	Overcast	The Staff, for G. B. Airy.
Guernsey	.....	.....	29.83	757.7	54	12.2	....	NE.	.....	.....	3	.....	5	.....	.....	.....	.....	D. clouds	Dr. S. E. Hoskins, F.R.S.
Helston	.....	.....	29.79	756.7	54	12.2	....	E.	.....	.....	7	.....	3o	.....	.....	0	0	Fine	M. P. Moyle.
Holyhead	.....	.....	29.91	759.7	48	8.9	....	E.	.....	.....	6	.....	3	.....	.....	.....	.....	D. clouds	John Tilston.
Kew (Observatory)	.....	.....	29.96	761.0	46.7	8.2	....	E.	16	7.2	....	.....	10	.....	.....	.....	.....	Threatening	The Staff.
Kingstown	.....	.....	29.92	760.0	48	8.9	....	ESE.	.....	.....	4	.....	7	.....	.....	.....	.....	D. clouds	George Mitchell.
Leicester, (Museum)	.....	.....	29.99	761.7	45.9	7.7	....	E.	.....	.....	1	.....	10	.....	.....	.....	.....	Overcast	Wm. J. Harrison, F.G.S.
Malta (Mediterranean)	.....	.....	29.64	752.8	63.6	17.6	...	NE.	.....	.....	2	.....	4k	.....	.....	.....	.....	D. clouds	Corp'l P. Bravis, A.H.C.
Nairn	.....	.....	30.12	765.0	49	9.4	....	SE.	.....	.....	2	.....	5	.....	.....	.....	.....	½ clouded	W. D. Penny.

Nassau, Bahamas			30.14	765.5	78.2	22.3		SE.			1		4					D. clouds	J. Belgrave.
Nottingham (Observatory)			30.01	762.2	45.7	7.6		SE			3		10k,d		E.	0	0	Overcast	E. J. Lowe, F. R. S.
Oscott (Saint Mary'sCollege)			29.96	761.5	45.0	7.2		ENE.			3		10					Overcast	Rev. Stephen Whitty.
Oxford (Radcliffe Obs'y)			29.95	760.7	50	10.0		E.			2		10					Overcast	J. W. Lucas.
Plymouth			29.84	757.9	50.8	10.4		ESE.			6		5					D. clouds	John Merrifield.
Roche's Point			29.74	755.4	49	9.4		ESE.			6		10					Raining	W. Kennedy.
Saint Ann's Head			29.89	757.4	48	8.9		ESE.			6		5					D. clouds	John C. Walker.
Saint Helier, Jersey			29.82	757.4	56.5	13.6		E.			5		8					4 clouded	A. P. Amy.
Sandwick Manse, Orkneys			30.19	766.8	45.5	7.5		E.	15	6.7			0					Blue sky	Rev. C. Clouston, LL. D.
Scutari Cemetery, Turkey			29.76	755.9	59.8	15.4		SSW.			1		8					D. clouds	Sergt. W. H. Lyne.
Sheffield			30.02	762.5	47.9	8.8		E.			2		10			0.007	0.18	Overcast	W. F. Cooper.
Silloth (Rectory)			30.02	762.5	46.1	7.8	64	SE.			3		6			0	0	D. clouds	Rev. Francis Redford.
Stonyhurst (Observatory)			30.02	762.5	42.0	5.6		E.			2		10					Overcast	Rev. S. J. Perry.
Stornoway, Lews C., Hebr.			30.10	764.5	50	10.0		E.			4		0					Blue sky	John Smith.
Stratfield Turgiss			29.94	760.5	49.8	9.9		NE.			2		10					Overcast	Rev. Charles H. Griffith.
Thurso			30.16	766.1	52	11.1		ESE.			1		2					Blue sky	John Trotter.
Truro (Royal Institution)			29.81	757.2	55	12.8		E.			5		5					D. clouds	W. Newcombe.
Valencia (Observatory)			29.62	752.3	49.5	9.7		E.	37	16.5			10					Raining	The Staff.
SUB-SERIES.																			
Calf of Man, Isle of Man					44	6.7		E.			6		10			0	0		Henry Mercer.
Cape Good Hope (Obs'y)			30.09	764.3	68.0	20.0	56	SSE.	15	6.7		0	1						The Staff, for E. J. Stone.
Hobart Town, Tasmania			29.93	760.2	61.0	16.1	93				2		10n			0.04	1.0	Heavy rain	Francis Abbott, F. R. A. S.
Leith (Restalrig Park)			30.11	764.6	42.0	5.6		E.			3		10k			0	0	Cloudy	Andrew Gibb.
Mauritius (Observatory)			29.83	757.7	74.0	23.3	89	ESE.	22.4	10.0		0	10		E.	0.69	17.5	Overcast	C. Meldrum.
Melbourne (Observatory)			30.02	762.5	50.3	10.2	73	W.	8	3.6			8			0.54	13.7	Showery	R. L. J. Ellery.
Monach Light-house, Hebr			30.09	764.3	48	8.9		SSE.			3	0	0			0	0		J. Youngclause.
North Unst, Shetland Isl'd			30.24	768.1	43	6.1		NE.			3	3	5		NE.				Robert Burnet.

NOTE.—Generally, the originals do not give the relative humidity, rain-fall, or distinction between upper and lower clouds. They give the wind-direction to 32 points; the weather by the Beaufort notation; the barometer for Cardington, Free Town, Galway, Oxford, Saint Heller, Sandwick, Stonyhurst, Leith, Monach, and North Unst as read off; the amount of cloudiness for Stornoway by the scale 0 to 4. The wind-force is given by the scale 0 to 12 in the official series, 0 to 6 in the sub-series, except in pounds per square foot for Greenwich and Hobart Town. The rain-fall is measured at Aberdeen at 10 a. m.; Bradford, 9 a. m.; Hobart Town, 7.30 a. m.; Nottingham, 6 p. m.; Mauritius, 9 a. m.; Sheffield, 8 a. m. following day, local time. The elevation of Dartmoor is 1,400 feet, or 426.7 meters; Davos Platz, 5,105 feet, or 1,556.0 meters; Fort Napier, 2,200 feet, or 670.6 meters.

COSTA RICA SERIES.

[By authority of the Minister of Foreign Affairs. Furnished by the co-operation of Señor Federico Maison, director of the Central Office of Statistics and Meteorology.]

San José			26.23	666.2			69.8	21.0	67	NE.			3		3c		NE.	0	0		Federico Maison.

NOTE.—In the originals, the barometer is given as read off, its instrumental error is not known; the elevation of San José is 1,145 meters, or 3,756.4 feet. The distinction between the upper and lower clouds is not made. The rain-fall is apparently measured at following midnight, and, in the originals, given in Spanish inches.

Bulletin of international meteorological observations, taken simultaneously on April 26, 1877—Continued.

DANISH SERIES.

[Furnished by the co-operation of Capt. N. Hoffmeyer, director of the Royal Danish Meteorological Institute at Copenhagen.]

Stations.	Barometer. Corrected for instrumental error and temperature. Inches.	Barometer. Corrected for instrumental error and temperature. Millimeters.	Barometer. Reduced to sea-level. Inches.	Barometer. Reduced to sea-level. Millimeters.	Temperature of the air. Fahrenheit.	Temperature of the air. Centigrade.	Relative humidity. Per cent.	Wind. Direction. From—	Wind. Velocity. Miles per hour.	Wind. Velocity. Meters per second.	Wind. Force. 0—10.	Clouds. Amount. Upper. 0—10.	Clouds. Amount. Lower. 0—10.	Clouds. Direction. Upper. From—	Clouds. Direction. Lower. From—	Rain-fall or melted snow in the past 24 hours. Inches.	Rain-fall or melted snow in the past 24 hours. Millimeters.	Weather.	Observer.
Copenhagen	.....	.....	30.03	762.7	38.7	3.7	82	NE.	.....	.....	2	.....	10	.....	.....	.....	.....	.....	.....
Fanöe	.....	.....	30.03	762.7	43.9	6.6	64	E.	.....	.....	2	.....	9	.....	.....	.....	.....	.....	.....
Godthaab, Greenland	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Stykkisholm, Iceland	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Thornshavn, Faröe	.....	.....	30.25	768.3	48.6	9.2	68	SE.	.....	.....	2	.....	1	.....	.....	.....	.....	.....	.....
Vestervig	.....	.....	30.06	763.4	44.6	7.0	61	NE.	.....	.....	6	.....	4	.....	.....	.....	.....	.....	.....

NOTE.—The originals give the wind-force by the scale 0 to 6; occasionally, weather by Vienna symbols. No distinction between the amount of upper and lower clouds.

FRENCH SERIES.

[Furnished by the co-operation of his excellency U. J. Le Verrier, director of the Paris Observatory, and the respective observers.]

Alençon	.....	.....	29.85	758.3	51.8	11	77	SE	.....	.....	1	.....	0	.....	.....	0	0	Clear	Normal School.
Amiens	.....	.....	29.87	758.8	51.1	10.6	86	W.	.....	.....	3	.....	8	.....	W.	0	0	Very cloudy.	Normal School.
Avignon (Normal School)	.....	.....	29.86	758.5	70.2	21.2	34	SW.	.....	.....	1	.....	2	.....	.....	0	0	Sl'tly cloudy	Mr. Giraud.
Bar-sur-Seine	.....	.....	29.84	757.9	60.8	16.0	40	SE	.....	.....	2	2c	.....	.....	.....	0	0	Sl'tly cloudy	C. Saillard.
Beaumette (near Angers)	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	Beaumette Observatory.
Beauvais	.....	.....	29.89	759.3	54.7	12.6	70	E.	.....	.....	2	.....	0	.....	.....	0	0	Clear	Normal School.
Besançon	.....	.....	29.86	758.4	61.7	16.5	44	SW.	.....	.....	3	.....	0	.....	.....	0	0	Clear	Normal School.
Bourgen Bresse	.....	.....	29.94	760.4	66.0	18.9	53	SW.	.....	.....	1	.....	2k	.....	N.	0	0	Sl'tly cloudy.	Normal School.
Bourges	.....	.....	29.85	758.2	59.5	15.3	66	SW.	.....	.....	2	.....	2	.....	E.	0	0	Sl'tly cloudy.	Normal School.
Brest	.....	.....	29.71	754.6	66.0	18.9	60	SW.	.....	.....	2	....	1k	.....	.....	0	0	.....	Naval Observatory.
Carcassonne	.....	.....	29.89	759.1	64.4	18	71	E.	.....	.....	2	.....	5	.....	W.	0	0	Cloudy.....	Normal School.

Caen			29.87	758.6	57.9	14.4	57	E.			1		1		W.	0	0	Clear	Normal School.
Chartres			29.80	757.0	65.3	15.7	96	E.			2		0			0	0	Clear	Normal School.
Châlons-sur-Marne			29.87	758.6	61.5	16.4	41	Calm.			0		2k			0	0	Sl'tly cloudy.	Normal School.
Clermont			29.75	755.6	67.8	19.9	34	SE.			1		2			0	0		Puy de Dome Observ'ry.
Commercy			29.89	759.1	54.1	12.3	59	E.			2	2o				0	0	Clear	Normal School.
Commune de Gréasque*			29.89	759.2	69.3	20.7	18	SW.			4		2		NE.	0	0		M. Kiva.
Grenoble			29.84	757.8	63.5	17.5	49	NW.			4		2k		N.	0	0	Sl'tly cloudy.	Normal School.
La Roche-sur-Yon			29.69	754.2	65.5	18.6	69	E			1		8		S.	0	0	Very cloudy.	Normal School.
Le Mans			29.84	757.9	61.7	16.5	46	SSE.			4		2		S.	0	0	Sl'tly cloudy.	Normal School.
Lons-Le-Saulnier			29.73	755.1	57.9	14.4	47	W.			1		0			0	0	Clear	Normal School.
Lorient			29.79	756.6	60.8	16.0	59	SSE.			3		0			0	0	Clear	Naval Observatory.
Mâcon (Normal School)			29.82	757.4	59.2	15.1	78	Calm.			0		0			0	0	Clear	Mr. Marchal.
Metz			29.93	760.6	51.1	10.6	48	NE.			1		0			0	0		M. A. Schuster.
Mirecourt			29.81	757.1	54.0	12.2	50	NW.			1		2		S.	0	0	Sl'tly cloudy.	Normal School.
Nismes			29.92	759.9	67.6	19.8	65	W.			2		10			0	0	Covered	Normal School.
Orleans			29.82	757.5	60.1	15.6	61	NE.			2		0			0	0	Clear	Normal School.
Paris (Observatory)			29.86	758.5	57.9	14.4	39	E.			2		0			0	0	Clear	National Observatory.
Privas			29.88	759.0	59.2	15.1	29	SW.			2		5		SW.	0	0	Cloudy	Normal School.
Rochefort (Observatory)			29.80	757.0	59.0	15.0	80	SE.			3		10		W.	0	0	Covered	Naval Observatory.
Rouen			29.87	758.6	60.4	15.8	42	N.			2		1		E.	0	0	Clear	Normal School.
Tarbes	28.72	729.4	29.76	756.0	68.0	20	83	SW.			1		5		E.	0	0	Cloudy	Normal School.
Villefranche			29.76	756.0	66.2	19	74	SE.			2		0			0	0	Clear	Normal School.
SUB SERIES.																			
Fort de France, Martinique			29.93	760.3	80.6	27													L'Abbé Marchésl.
Marseilles (Observatory)			29.83	757.7	63.9	17.7	74	SSW.			1		1			0	0	Partly cl'dy	The Staff.
Mont-Louis	24.72	627.8	30.03	762.8	47.8	8.1	85	SE.	9.3	4.17			8		SW.	0.236	6.0		Mr. Falgnère.
Montsouris, Paris			29.85	758.3	59.2	15.1	36	ENE.			1		0			0	0		Montsouris Observatory.
Perpignan			29.89	759.3	58.3	14.6	71	SE.	1.9	0.83			8		NW.	0	0		Dr. Fines.
Pic du Midi (summit), H. P																			
Pic du Midi (plantade), H. P	22.36	568.0			41.2	5.1		NW.			3		6			0.157	4.0	R'n and snow	General de Nansonty and M. Baylac, Obs'rs.
Saint Maur (near Paris)			29.86	758.4	61.2	16.2	40	NE.			1		0			0	0	Clear	L. Renou.
Toulouse (Observatory)			29.87	758.7	63.7	17.6	75	SSE.			2		3			0.087	2.2		The Staff.
Tours			29.80	757.0	64.0	17.8	52	ESE.			1		1		SW.	0	0		C. Marquet.
Versailles (near Paris)			29.87	758.7	60.8	16.0	44	SE.			1		0			0	0	Very clear	Dr. A. Bérigny.
Zi-Ka-Wei (near Shanghai			29.77	756.1	63.7	17.6	94	SSE.	6.3	2.8			10n			0.201	5.1	Raining	Marc Dechevrens, S. J.

NOTE.—Generally the originals give the wind-force by the scale 0 to 7; no distinction between upper and lower clouds, and, in the official series, the amount by the scale 0 to 4; the rain-fall as measured at 7, 8, or 9 a. m., local time; at Clermont, 9 a. m. of the following day; the weather in general terms as published; for Caen, the barometer reduced to freezing but not to sea-level. The elevation of Clermont is 388 meters, or 1,272.9 feet; Commune de Gréasque, 322 meters, or 1,056 4 feet; Tarbes, 308 meters, or 1 010 feet; Mont-Louis, 1,586.40 meters, or 5,204.8 feet; Pic du Midi (summit), 2,877 meters, or 9,439.1 feet; Pic du Midi (plantade), 2,366 meters, or 7,762.6 feet. In correcting the Mont-Louis barometric observations for altitude, the constant 135. millimeters has been added. *Bouches-du-Rhône. At Clermont the observations have been taken at 0.50, instead of 0.55, p. m.; Versailles, at 1.0, instead of 0.51, p. m., local time.

Bulletin of international meteorological observations, taken simultaneously on April 26, 1877—Continued.

GERMAN SERIES.

[Furnished by the co-operation of Professor Dr. G. Neumayer, director of the German Naval Observatory, Hamburg.]

Stations.	Barometer.				Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rain-fall or melted snow in the past 24 hours.		Weather.	Observer.
	Corrected for instrumental error and temperature.		Reduced to sea-level.					Direction.	Velocity.		Force.	Amount.		Direction.					
	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	Upper. 0—10.	Lower. 0—10.	Upper. From—	Lower. From—	Inches.	Millimeters.		
Bamberg	.....	.....	29.95	760.7	54.1	12.3	65	NW.	.....	.....	3	.....	5	NW.	.....	0	0	.....	Prof. T. Hoh.
Berlin	.....	.....	30.04	763.0	42.8	6.0	67	N.	.....	.....	1	.....	10	.....	.....	0	0	.....	Prof. Arndt.
Breslau	.....	.....	30.02	762.6	41.5	5.3	70	NW.	.....	.....	3	.....	10	.....	.....	0	0	.....	Royal University Obs'y.
Carlsruhe	.....	.....	29.84	757.8	59.0	15.0	48	N.	.....	.....	2	.....	2	.....	.....	0	0	.....	Albert Sons.
Cassell	.....	.....	30.00	762.0	48.2	9.0	...	ENE.	.....	.....	4	.....	10	NW.	.....	0	0	.....	Dr. H. Möbl.
Crefeld	.....	.....	29.93	760.3	50.9	10.5	57	NE.	.....	.....	3	.....	8	.....	.....	0	0	.....	Director Lose.
Emden	.....	.....	30.14	765.6	44.1	6.7	80	E.	.....	.....	2	.....	10	.....	.....	0	0	.....	Prof. Prestel.
Frankfort-on-the-Main	.....	.....	29.96	760.9	57.0	13.9	38	E.	.....	.....	1	.....	4	.....	.....	0	0	.....	Physical Society.
Friedrichshafen	28.47	723.0	29.90	759.5	51.6	10.9	75	SSW.	.....	.....	3	.....	0	.....	.....	0	0	.....	M. Wilhelm.
Hamburg	.....	.....	30.04	763.1	42.3	5.7	70	NW.	.....	.....	1	.....	10k,e	.....	.....	0	0	Cloudy	Captain F. Hegemann.
Kiel	.....	.....	30.02	762.6	41.5	5.3	84	NE.	.....	.....	2	.....	10	.....	.....	0	0	.....	Prof. G. Karsten.
Königsberg, Prussia	.....	.....	29.97	761.2	43.7	6.5	76	W.	.....	.....	2	.....	5	.....	.....	0.031	0.8	.....	Prof. E. Luther.
Köslin	.....	.....	30.00	762.0	39.2	4.0	...	N.	.....	.....	2	.....	4	.....	.....	0.102	2.6	.....	H. Müller.
Leipsic	.....	.....	30.02	762.6	43.5	6.4	64	NE.	.....	.....	1	.....	10	.....	.....	0	0	.....	Prof. Bruhns.
Memel (Naval School)	.....	.....	30.00	762.0	43.0	6.1	87	SSW.	.....	.....	1	.....	10k,e	.....	.....	0.008	0.2	.....	Reinbrecht and Skalweit
Münster	.....	.....	29.96	761.0	49.8	9.9	55	NE.	.....	.....	1	.....	10	.....	.....	0	0	.....	Prof. E. Heis.
Neufahrwasser	.....	.....	29.96	761.0	41.9	5.5	88	E	.....	.....	2	.....	10	.....	.....	0.059	1.5	.....	A. Lottes.
Posen	.....	.....	30.00	762.0	43.5	6.4	73	NW.	.....	.....	4	.....	10	.....	.....	Inap.	Inap.	Light rain	Dr. Magener.
Strassburg (in Alsace)	.....	.....	29.87	758.0	57.2	14.0	35	Calm.	.....	.....	0	.....	1	.....	.....	0	0	.....	Dr. Schur.
Stuttgart	.....	.....	29.84	758.6	58.1	14.5	45	SW.	.....	.....	1	.....	2	W.	.....	0	0	.....	Prof. Schoder.
Treves, Trier	.....	.....	29.77	756.1	55.4	13.0	51	NE.	.....	.....	3	.....	2	.....	.....	0	0	.....	Prof. Fiesch.
Weissenburg, Bavaria	28.37	720.7	29.88	758.9	51.6	10.9	76	NNW.	.....	.....	1	.....	8	NW.	.....	0	0	Dense fog	T. V. Dicknether.
Wustrow (Naval School)	.....	.....	30.08	764.0	37.6	3.1	83	NE.	.....	.....	3	.....	10	.....	.....	0.024	0.6	.....	E. F. Schütz.

NOTE.—The elevation of Friedrichshafen is 413.4 meters, or 1,356.3 feet; Weissenburg, 431 meters, or 1,414.0 feet. In the originals the distinction between the amount of upper and lower clouds is not made. It is not always certain that the remarks in the weather column refer to the moment of observation. At Königsberg the observations have been at 2.0, instead of 2.5, p. m.; Posen, 2.0, instead of 1.51 p. m., local time.

GREEK SERIES.

[Furnished by the co-operation of Prof. Dr. J. F. Julius Schmidt, director of the Royal Observatory at Athens.]

Athens	.....	.....	29.79	756.6	70.3	21.3	....	SW.	.....	.....	....	.....	.....	.....	.....	.....	.....	Cloudy	Dr. J. F. J. Schmidt.

NOTE.—The originals give the barometer reduced to freezing, but not to sea-level; occasionally, the kind of clouds; the weather as published. They omit the humidity, wind-force, amount of cloudiness, and rain-fall.

INDIAN SERIES.

[Furnished by the co-operation of H. F. Blanford, meteorological reporter to the Government of India.]

Kurrachee	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Deesa	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Bombay	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Poona	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Lahore	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Belgaum	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Bangalore	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Rorkee	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Agra	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Trichinopoly	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Nagpur	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Madras	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Lucknow	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Allahabad	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Patna	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Hazaribagh	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Cuttack	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Calcutta, Alipore	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Goalpara	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Chittagong	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Sibsagar	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Rangoon	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....
Jubbulpore	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....

ITALIAN SERIES.

[Furnished by the co-operation of his excellency the minister of agriculture, industry, and commerce, and the respective observers.]

Udine	.....	.....	29.86	758.4	60 1	15.6	45	W.	2.5	1.1	....	.....	2	.....	.....	0.492	12.5	Thunder storms.	Prof. Giovanna Clodig.
Stelvio	29.82	554.3	29.56	750.9	30.2	— 1.0	...	E.	.....	.....	1	.....	0	.....	.....	0	0	.....	Signora Ernesta Manfredi.
Valdobbia	22.02	559.4	29.85	758.2	28.8	— 1.8	99	W.	.....	.....	2	.....	4	NW.	.....	0	0	.....	Ab. Dom. Mongini.

Bulletin of international meteorological observations, taken simultaneously on April 26, 1877—Continued.

ITALIAN SERIES—Continued.

Stations.	Barometer. Corrected for instrumental error and temperature. Inches.	Barometer. Corrected for instrumental error and temperature. Millimeters.	Barometer. Reduced to sea-level. Inches.	Barometer. Reduced to sea-level. Millimeters.	Temperature of the air. Fahrenheit.	Temperature of the air. Centigrade.	Relative humidity. Per cent.	Wind. Direction. From—	Wind. Velocity. Miles per hour.	Wind. Velocity. Meters per second.	Wind. Force. 0—10.	Clouds. Amount. Upper. 0—10.	Clouds. Amount. Lower. 0—10.	Clouds. Direction. Upper. From—	Clouds. Direction. Lower. From—	Rain-fall or melted snow in the past 24 hours. Inches.	Rain-fall or melted snow in the past 24 hours. Millimeters.	Weather.	Observer.
Padua	.....	.....	29.86	758.4	60.8	15.9	48	ESE.	6.9	3.1	....	.....	4	NE.	.....	0	0	.....	Prof. Dott. Lorenzoni.
Vicenza	.....	.....	29.86	758.5	61.0	16.1	34	SE.	3.8	1.7	....	.....	3	N.	.....	0	0	.....	Conte Alm. Da Schio.
Verona	.....	.....	29.87	758.8	63.0	17.2	44	E.	.....	.....	2	.....	4	.....	.....	0	0	.....	Dott. b. Bertoncelli.
Bergamo	28.56	725.3	29.85	758.1	59.0	15.0	37	SW.	.....	.....	2	.....	2	.....	.....	0	0	.....	Prof. Trionfini Carlo.
Domodossola	.....	.....	29.79	756.7	63.3	17.4	33	SW.	.....	.....	6	.....	2	.....	.....	0	0	.....	Prof. Giuseppa Calza.
Milan	.....	.....	29.85	758.1	65.1	18.4	58	ESE.	.....	.....	2	....	2	E.	.....	0	0	.....	Ab. Gio Capelli.
Pavia	.....	.....	29.86	758.5	61.0	16.1	34	E.	.....	.....	4	.....	2	E.	.....	0	0	.....	Prof. Gio. Cantoni.
Moncalieri	.....	.....	29.83	757.6	61.7	16.5	41	SSW.	3.4	1.4	....	.....	5	N.	.....	0	0	.....	Prof. P. F. Denza.
Mondovi	27.96	710.2	29.83	757.7	57.6	14.2	37	NNW.	.....	.....	4	.....	5	W.	.....	0	0	.....	Prof. D. C. Bruno.
Porto Maurizio	.....	.....	29.87	758.6	61.2	16.2	59	E.	.....	.....	6	.....	9	.....	.....	0	0	.....	Prof. L. Vassallo.
Genoa	.....	.....	29.82	757.5	64.6	18.2	43	N.	4.9	2.2	....	.....	4	NE.	.....	0	0	.....	Prof. G. M. Garibaldi.
Piacenza	.....	.....	29.87	758.7	60.1	15.6	46	E.	6.9	3.1	....	.....	5	.....	.....	0	0	.....	Dott. G. Manzi.
Parma	.....	.....	29.85	758.3	63.3	17.4	50	ESE.	.....	.....	4	.....	1	.....	.....	0	0	.....	Prof. P. Pigorini.
Florence	.....	.....	29.83	757.7	66.7	19.3	27	.	.....	.....	4	.....	4	.....	.....	0	0	.....	Cav. F. Meucci.
Leghorn	.....	.....	29.81	757.1	65.5	18.6	28	NE.	10.5	4.7	..	.....	5	S.	.....	0	0	.....	Prof. P. Monte.
Siena	28.66	726.5	29.79	756.7	61.2	16.2	32	NE.	4.9	2.2	....	.....	6	E.	.....	0	0	.....	Prof. L. Toscani.
Urbino	28.33	719.4	29.87	758.6	55.0	12.8	53	NE.	.....	.....	4	.....	7	.....	.....	0	0	.....	Prof. P. Serpieri.
Pesaro	.....	.....	29.89	759.2	57.4	14.1	73	NE.	19.2	8.6	....	....	8	W.	.....	0	0	.....	Prof. Luigi Guidi.
Ancona	.....	.....	29.78	756.2	60.8	16.0	48	SE.	.....	.....	4	.....	5	SW.	.....	0.012	0.3	Light rain ..	Prof. F. DeBosis.
Grosseto	.....	.....	29.80	756.9	66.2	19.0	59	NNE.	.....	.....	4	.....	6	NW.	.....	0	0	.....	Avv. P. Ponticelli.
Rome	.....	.....	29.79	756.7	61.0	16.1	74	NNE.	3.8	1.7	....	.....	10	.....	.....	0.307	7.8	Raining.....	Profs. P. Secchi and L. Respighi.
Naples, O. U	.....	.....	29.76	756.0	62.6	17.0	59	NE.	.....	.....	4	.....	10	SE.	.....	0	0	.....	Prof. L. Palmieri.
Lecce	.....	.....	29.84	757.8	57.2	14.0	67	N.	7.4	3.3	....	.....	10	.....	.....	0.016	0.4	Light rain ..	Prof. C. DeGiorgi.
Cosenza	.....	.....	29.82	757.3	56.8	13.8	75	NE.	11.2	5.0	....	.....	10	.....	.....	0	0	.....	Prof. F. D. Couti.
Cagliari	.....	.....	29.69	754.2	64.8	18.2	69	SE.	.....	.....	2	.....	10	E.	.....	0.012	0.3	Light rain ..	Prof. A. Pacinotti.
Riposto, Sicily	.....	.....	29.67	753.7	65.1	18.8	54	NE	.....	.....	2	.....	4	SE.	.....	0	0	.....	Prof. F. Cafiero.
Palermo	.....	.....	29.62	752.4	68.7	20.4	61	ENE.	2.5	1.1	....	.....	9	.....	.....	0	0	.....	Prof. G. Cacciatore.

Caltanissetta	27.73	704.3	29.63	752.7	61.5	16.4	51	E.			6		10	N.		0	0		Prof. A. Pagani.
Syracuse			29.62	752.4	63.5	17.5	75	NE.			6		10	SW.		0	0		Prof. V. Giuliano.
SUB-SERIES.																			
Naples, S. R			29.72	754.9	58.5	14.7	69	NE.	3.2	1.7			10			0.035	0.9		Prof. F. Brioschi.

NOTE.—The originals give the wind-force by the scale 0 to 4, or the velocity in kilometers per hour; no distinction between the amount of upper and lower clouds; occasionally, the weather by the Vienna symbols. The elevation of Stelvio is 2,543.0 meters, or 8,342.9 feet; Valdobbia, 2,548.0 meters, or 8,359.3 feet; Bergamo, 379.6 meters, of 1,245.3 feet; Mondovi, 556 meters, or 1,824.2 feet; Siena, 348.5 meters, or 1,143.3 feet; Urbino, 451 meters, or 1,479.7 feet; Caltanissetta, 570.3 meters, or 1,871.0 feet.

JAPANESE SERIES.

[Furnished by the co-operation of the Imperial University of Tokio, Japan.]

Tokio, Yeddo			30.01	762.2	61	16.1	100	S.	2	0.9			10			0	0		Prof. P. V. Veeder.

NOTE.—The originals give the rain-fall as measured at 7 a. m., local time; they do not give the state of the weather at the moment of observation.

MEXICAN SERIES.

By authority of the secretary of public works.

[Furnished by the co operation of Senor Mariano Bárcena, director of the Central Meteorological Observatory in the city of Mexico.]

Mexico (Central Obs'y)																				Mariano Bárcena, Vicente Reyes, Miguel Peres, engineers in charge.

NOTE.—The elevation of Mexico is 2,290 meters, or 7,512.9 feet. The rain-fall is measured at 6 a. m., local time.

NETHERLANDS SERIES.

[Furnished by the co-operation of Prof. Buys Ballot, director of the Royal Meteorological Institute of the Netherlands, at Utrecht.]

Flushing			29.99	761.8	48.4	9.1		ENE.			3					0	0			
Groningen			29.98	761.4	44.2	6.8		NE.			2									
Helder			30.01	762.3	44.2	6.8		NE.			2					0	0			
Utrecht			29.93	760.6	46.8	8.2	55	NE.			4		10			0	0		Dull	H. vd Brink.

NOTE.—The originals give the wind-pressure in kilograms per square meter; they do not give the humidity; for Utrecht, they give the weather as published, from which the amount of cloudiness is taken by the scale 0 to 4, without distinguishing between upper and lower clouds. It is assumed that the barometer-readings have been reduced to sea-level.

Bulletin of international meteorological observations, taken simultaneously on April 26, 1877—Continued.

NORWEGIAN SERIES.

[Furnished by the co-operation of Prof. H. Mohn, director of the Royal Norwegian Meteorological Institute, at Christiania.]

Stations.	Barometer.				Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rain-fall or melted snow in the past 24 hours.		Weather.	Observer.
	Corrected for instrumental error and temperature.		Reduced to sea-level.					Direction.	Velocity.		Force.	Amount.		Direction.					
	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	Upper. 0—10.	Lower. 0—10.	Upper. From—	Lower. From—	Inches.	Millimeters.		
Bergen	.....	.....	30.17	766.4	49.3	9.6	31	NNW.	5.6	2.5	....	.....	0	.....	.....	0	0	.....	
Brönö	.....	.....	30.00	767.1	50.0	10.0	39	Calm.	0	0	....	.....	0	.....	.....	0	0	.....	
Christiania	.....	.....	30.16	766.0	47.5	8.6	93	E.	4	2	...	.....	8	.....	.....	0	0	.....	
Tromsö	.....	.....	30.17	766.2	32.2	0.1	53	SW.	7	3	....	.....	0	.....	.....	0	0	.....	

NOTE.—The originals give the amount of cloudiness, without distinguishing between upper and lower clouds; occasionally, the weather by the Vienna symbols. The cloudiness and weather at Bergen refer to 2 h. p. m., local time, instead of 1h. 4m.

PORTUGUESE SERIES.

[Furnished by the co-operation of J. C. De Brito Capello, director of the Meteorological Observatory of the Infante Don Luis, at Lisbon.]

Angra, Azores	.....	.....	29.69	754.1	55.0	12.8	71	WNW.	15.0	6.7	...	.....	6	.....	.....	.....	.....	Raining	Dr. J. A. Sampaio.
Campo Major	.....	.....	29.93	760.3	57.0	13.9	76	SSW.	13.0	5.8	...	.....	10	SSW.	.....	0	0	.....	Dr. A. M. R. dos Santos.
Funchal, Madeira	.....	.....	29.93	760.1	67.8	19.9	73	W.	8.7	3.9	...	.....	9	.....	.....	0.004	0.1	.....	Capt. D. A. de Cunha.
Lisbon	.....	.....	29.83	758.1	61.2	16.2	72	SSW.	24.8	11.1	...	.....	10	.....	.....	0.004	0.1	....	The Observatory.
Ponta Delgada, Azores	.....	.....	29.79	754.9	60.1	15.6	53	NW.	11.9	5.3	...	.....	4	.....	.....	0.035	1.4	.....	

NOTE.—The originals give the wind-velocity in kilometers for the hour preceding the observation; occasionally, the weather by the Vienna symbols; the amount of cloudiness, without distinguishing between upper and lower clouds; the barometer reduced to freezing but not to sea-level. The rain-fall at Lisbon is measured at noon instead of 6h. 8m., p. m.

FOR THE INTER

FRENCH SERIES.

RUSSIAN SERIES.

[Furnished by the co-operation of Prof. H. Wild, director of the Imperial Central Physical Observatory of Russia, at St. Petersburg.]

Warsaw	.....	.....	29.96	760.9	47.?	8.6	61	SSW.	7	3	....	.....	10	.....	.....	.....	.....	.....	Astronomical Obs'y.
Wilna	.....	.....	29.9?	761.5	48.1	9.4	79	E.	2	1	....	.....	10	.....	.....	.....	.....	.....	Astronomical Obs'y.
Dorpat	.....	.....	30.13	765.4	48.2	9.0	27	E.	11	5	....	.....	1	.....	.....	.....	.....	.....	Physical Cabinet.
St. Petersburg	.....	.....	30.2?	767.?	46.(	8.1	33	NE.	7	3	....	.....	8	.....	.....	.....	.....	.....	Central Physical Obs'y.
Knopio	.....	.....	30.25	768.3	44.(	7.0	61	NE.	7	3	....	.....	0	.....	.....	.....	.....	.....	Ch. Forston.
Kieff	.....	.....	29.74	755.4	40.1	4.5	62	NNE.	13	6	....	.....	10	.....	.....	.....	.....	.....	Physical Cabinet.
Nikolaiev	.....	.....	29.4?	748.7	50.?	10.4	88	NE.	29	13	....	.....	10	.....	.....	.....	.....	Light rain ..	Kurdakof.
Kertch	.....	.....	29.5?	751.2	53.2	11.8	78	SSW.	16	7	..	.....	10	.....	.....	.....	.....	.....	Lagorio.
Moscow	.....	.....	30.07	763.8	43.(	6.1	52	NNE.	11	5	....	.....	0	.....	.....	.....	.....	.....	Meteorological Obs'y.
Lugan	.....	.....	9.4?	748.?	54.?	12.5	76	SSE.	19	8	....	.....	9	.....	.....	Blank	Blank	.....	Meteorological Obs'y.
Archangel	.....	.....	30.26	768.5	34.?	1.4	82	WNW.	18	8	...	.....	9	.....	.....	.....	.....	.....	Ogorodnikoff.
Tiflis	28.33	719.5	29.67	753.7	74.7	23.7	29	SE.	4	2	....	.....	4	.....	.....	.....	.....	.....	Physical Observatory.
Astrakhan	.....	.....	29.7?	756.5	61.7	16.5	54	ESE.	13	6	....	.....	8	.....	.....	.....	.....	.....	Sebastianof.
Kasan	.....	.....	29.97	761.2	43.?	6.4	3?	N.	7	3	....	.....	0	.....	.....	.....	.....	.....	Physical Cabinet.
Orenburg	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	..	.....	.....	.....	.....	.....	.....	.....	Tchernischef.
Ekaterinburg	29.06	738.1	30.04	763.0	33.1	0.6	47	SE.	4	2	..	.....	0	.....	.....	.....	.....	.....	Meteorological Obs'y.
Nukuss	.....	.....	29.80	756.8	75.4	24.1	34	ENE.	18	8	....	.....	1	.....	.....	.....	.....	.....	
Kasaly	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	..	.....	.....	.....	.....	.....	.....	.....	Bobrof.
Tashkend	28.15	715.1	29.76	755.8	70.1	26.6	35	NW.	22	10	....	.....	4	.....	.....	.....	.....	.....	Michelson.
Barnaul	.....	.....	29.63	752.5	37.1	3.3	76	NW.	2	1	..	.....	10	.....	.....	.....	.....	.....	Meteorological Obs'y.
Yeniseisk	.....	....	29.49	749.1	32.8	3.8	51	NW.	4	2	..	.....	9	.....	.....	.....	.....	.....	Marks.
Irkutsk	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	..	.....	.....	.....	.....	.....	.....	.....	Usolsef.
Oorga	.....	.....	.....	.....	30.0	—1.1	....	Calm.	0	0	....	.....	4	.....	.....	.....	.....	.....	Mosain.
Peking, China	.....	.....	29.69	754.0	51.8	11.0	83	Calm.	0	0	....	.....	8	.....	.....	Blank	Blank	.....	Physical Observatory.
Nertchinsk	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	..	.....	.....	.....	.....	.....	.....	.....	Meteorological Obs'y.
Vladivostock	.....	.....	29.80	756.8	43.2	6.2	59	SE.	13	6	....	.....	8	.....	.....	.....	.....	Lunar corona	
Nikolaievsk, on the Amoor	.....	.....	.....	.....	25.3	—3.7	....	Calm.	0	0	....	.....	10	.....	.....	.....	.....	.....	

NOTE.—The originals give the amount of cloudiness without distinguishing between upper and lower clouds; occasionally, the weather by the Vienna symbols; they omit the rain-fall. The elevation of Tiflis is 409 meters, or 1,341.8 feet; Ekaterinburg, 306.4 ? meters, or 1,005.2 ? feet; Tashkend, 494.2 ? meters, or 1,621.3 ? feet; Irkutsk, 392 meters, or 1,286 feet; Nertchinsk, 592.0 ? meters, or 1,942.2 ? feet; Oorga, 1,281.0 ? meters, or 4,202.6 ? feet.

SPANISH SERIES.

[Furnished by the co-operation of Antonio Aguilar, director of the Royal Observatory at Madrid; Don Cecilio Pujazon, captain royal navy, director of the Naval Observatory at San Fernando, and the respective observers.]

Madrid	.....	.....	29.86	752.4	65.3	18.5	56	SW.	10.4	4.66	....	0	6	.....	.....	0.008	0.2	Cloudy	Royal Observatory.
San Fernando	.....	.....	29.9?	761.6	65.4	18.4	60	SW.	4.1	2.2	....	0	6	.....	SW.	0	0	.....	Naval Observatory.
SUB-SERIES.																			
Havana, Cuba, W. I	.....	.....	30.06	763.4	72.3	22.4	68	SE.	8.3	3.7	....	0	0	.....	.....	0	0	Clear	Benito Vines, S. J.

NOTE.—The originals give the weather in general terms, as published; rain-fall for San Fernando from preceding to following midnight; wind-velocity for Madrid in kilometers per hour.

Bulletin of international meteorological observations, taken simultaneously on April 26, 1877—Continued.

SWEDISH SERIES.

[Furnished by the co-operation of Prof. R. Rubenson, director of the Royal Swedish Meteorological Institute at Stockholm, and of Dr. H. H. Hildebrandsson, chief of the meteorological division of the Upsala Observatory.]

Stations.	Barometer. Corrected for instrumental error and temperature.		Barometer. Reduced to sea-level.		Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rain-fall or melted snow in the past 24 hours.		Weather.	Observer.
								Direction.	Velocity.		Force.	Amount.		Direction.					
	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	Upper. 0—10.	Lower. 0—10.	Upper. From—	Lower. From—	Inches.	Millimeters.		
Haparanda	.....	.....	30.31	769.8	36.7	2.6	58	Calm.	.....	.....	0	.....	0	.....	.....	0	0	.....	
Umea	.....	.....	30.32	770.0	45.3	7.4	45	NW.	.....	.....	2	.....	0	.....	.....	0	0	.....	
Hernosand	.....	.....	30.24	768.1	42.8	6.0	32	NE.	.....	.....	4	.....	5	.....	.....	0	0	.....	
Stockholm	.....	.....	30.10	764.6	37.0	2.8	69	NE.	.....	.....	4	.....	10	.....	.....	0	0	.....	
Wisby	.....	.....	30.02	762.4	38.1	3.4	90	ESE.	.....	.....	4	.....	4	.....	.....	0.051	1.3	.....	
SUB-SERIES.																			
Upsala	.....	.....	30.14	765.5	38.3	3.5	66	NE.	10.5	4.7	...	.....	10	.....	.....	0	0	.....	Dr. Hildebrandsson.

NOTE.—The originals give the wind-force by the scale 0 to 6, and Upsala also velocity in meters per second; occasionally, the weather by the Vienna symbols, or in general terms; no distinction between the amount of upper and lower clouds. The rain-fall is measured at 8 a. m., local time.

SWISS SERIES.

[Furnished by the co-operation of Prof. R. Wolf, director of the Observatory at Zurich, and of Prof. E. Plantamour, director of the Observatory at Geneva.]

Geneva	28.44	722.3	29.86	758.4	56.3	13.5	52	N.	.....	.....	2	.....	2	.....	.....	0	0	Clear	The Observatory.
Zurich	28.25	717.5	29.87	758.7	59.0	15.0	46	NW.	.....	.....	1	.....	0	.....	.....	0	0	Clear	The Observatory.

NOTE.—For Geneva the corresponding departures from the normal values are: Barometer, −2.1 mm; thermometer, 0.0 cent.; relative humidity, −5 per cent.

NOTE.—The rain-fall is measured at Zurich at 7 a. m. on the following day. The originals give the barometer reduced to freezing but not to sea-level; the wind-force by the scale 0 to 4 for Zurich; the amount of cloudiness without distinguishing between upper and lower clouds; the weather in general terms. The elevation of Geneva is 408 meters, or 1,339 feet, and that at Zurich 470 meters, or 1,542 feet.

TURKISH SERIES.

[Furnished by the co-operation of A. Coumbary, Effendi, director of the Central Observatory at Constantinople, and of Prof. C. V. A. Van Dyck, superintendent of the Lee Observatory at Beirut.]

Constantinople		29.80	756.9	61.3	16.3	55	WSW.	4	2.0			8		SW.	0	0		The Observatory.
Fao, Persian Gulf		30.08	764.0	72.7	22.6		NW.			3		10						
Salonica		29.83	757.6	68.4	20.2		W.			2		2						
Valona		29.81	757.2	64.0	17.8		E.			1		10						A. Buhran.
Varna		29.98	761.5	59.0	15.0		NW.			0		5						
SUBSERIES.																		
Beirut, Syria (Lee Obs'y)		29.93	760.1	70.5	21.4	72	NE.			1		6c			0	0	D. clouds	Prof. C. V. A. Van Dyck.

NOTE.—The originals give the wind-force by the scale 0 to 7 (except Beirut by the scale 0 to 12, and Constantinople velocity in meters per second); the weather in general terms as published, except Beirut by the Beaufort notation; no distinction between upper and lower clouds, and, except Constantinople and Beirut, the amount by the scale 0 to 4. It is assumed, except for Constantinople, that the barometer is reduced to sea-level.

CANADIAN SERIES.

[Furnished by the co-operation of Prof. G. T. Kingston, director of the Magnetic Observatory at Toronto, and superintendent of the Meteorological Office of the Dominion of Canada, and the respective observers. Those marked with a star (*) are also telegraphed daily to the office of the Chief Signal-Officer U. S. Army.]

Bathurst, New Brunswick			29.65	753.1	44.0	6.7	82	NW.	8	3.6			10					Hon. J. Ferguson.
Brockville, Ontario			30.13	765.3	49	9.4		Calm.	0	0		0	0			0	0	Clear	W. R. Bigg.
*Chatham, New Brunswick			29.64	752.8	43	6.1	81	N.	15	6.7			10ks		N.	0.04	1.0	Cloudy	G. A. Blair.
Charlottetown, Pr. Edw. Isl			29.50	749.3	35	1.7	95	N.	13	5.8			10n			0.36	9.14	Light rain	H. J. Cundall, C. E.
Cornwall, Ontario			30.09	764.3	43.9	6.6	48	N.			1	0	0			0	0	Clear	James Smith, M. A.
Dalhousie, New Brunswick			29.76	755.9	40.7	4.8	83	W.			2					0	0	Threatening	H. A. Johnson.
Esquimault, Br. Columbia			30.01	763.0	43.8	6.6	90	NE.				0	0			0	0	Clear	W. H. Bevis.
*Father Point, Quebec			29.89	759.2	36	2.2	75	N.	10	4.5		5k	5e	N.	N.	0	0	Cloudy	J. McWilliams.
Fredericton, New Brunsw'k			29.75	755.6	42.4	5.8	65	N.	9	4.0			10			0	0	Fine	Professor Harrison.
*Fort Garry, Manitoba			30.35	770.9	28	−2.2	85	SE.	3	1.3		0	0			0	0	Clear	James Stewart.
Goderich, Ontario			30.20	767.1	42.6	5.9	76	Calm.			0	3c	1s	NW.		0	0	Clear	H. J. Strang, M. A.
Granton, Ontario	29.03	737.3	30.15	765.8	43	6.1	67	SE.			1	0	0			0	0	Clear	James Grant.
*Halifax, Nova Scotia			29.53	750.0	46	7.8	77	W.	10	4.5		2c	5ks		NW.	0	0	Cloudy	F. Allison, M. A.
Hamilton, Ontario			30.24	768.1	42.7	5.9	58	E.			2	0	0			0	0	Clear	George Dickson.
Heart's Content, N'wf'ndl'd			29.84	757.9	39	3.9	86	SE.			4		10n			0.13	3.3	Raining	E. Weedon.
*Kingston, Ontario			30.18	766.0	47	8.3	49	NE.	1	0.4		0	0			0	0	Clear	S. Woods, M. A.
*Montreal, Quebec			30.07	763.8	46	7.8	41	NW.	8	3.6		0	0			0	0	Clear	C. H. McLeod, C. E.
*Parry Sound, Ontario			30.21	767.3	38	3.3	72	Calm.	0	0		2cs	0			0	0	Fair	Rev. R. Mosley.
Port Dover, Ontario			30.20	767.1	39	3.9	73	N.	3	1.3		0	0			0	0	Clear	H. Morgan.
Port Hastings, Nova Scotia			29.46	748.5	38.2	3.4		NW.	12	5.4						0	0	Foggy	Peter Grant.
Port Stanley, Ontario			30.18	766.0	41	5.0	81	E.	8	3.6		2ck	0	W.		0	0	Clear	M. Payne.
Quebec, Quebec			29.95	760.7	45	7.2	24	SW.	8	3.6		0	0			0	0	Clear	Captain Ashe, R. N.
*Rockliffe, Ontario					40	4.4	62	W.	4	1.8		0	0			0	0	Clear	W. H. McIntyre.

Bulletin of international meteorological observations, taken simultaneously on April 26, 1876—Continued.

CANADIAN SERIES—Continued.

Stations.	Barometer. Corrected for instrumental errors and temperature. Inches.	Barometer. Corrected for instrumental errors and temperature. Millimeters.	Barometer. Reduced to sea-level. Inches.	Barometer. Reduced to sea-level. Millimeters.	Temperature of the air. Fahrenheit.	Temperature of the air. Centigrade.	Relative humidity. Per cent.	Wind. Direction. From—	Wind. Velocity. Miles per hour.	Wind. Velocity. Meters per second.	Wind. Force. 0—10.	Clouds. Amount. Upper. 0—10.	Clouds. Amount. Lower. 0—10.	Clouds. Direction. Upper. From—	Clouds. Direction. Lower. From—	Rain-fall or melted snow in the past 24 hours. Inches.	Rain-fall or melted snow in the past 24 hours. Millimeters.	Weather.	Observer.
St. John, New Brunswick	.....	.....	29. 70	754. 4	43	6. 1	75	NW.	9	4. 0	....	.....	10	.....	.....	0	0	Overcast	G. Murdoch, C. E.
*Saugeen, Ontario	.....	.....	30. 16	766. 1	40	4. 4	73	SE.	4	1. 8	....	0	0	.....	.....	0	0	Clear	K. Stewart.
Stayner, Ontario	.....	.....	30. 21	767. 3	36	2. 2	64	Calm.	0	0	....	0	0	.....	.....	0	0	Clear	R. J. Cole.
Stratford, Ontario	28. 66	733. 0	30. 18	766. 6	39. 1	3. 9	71	E.	3	1. 3	...	0	0	.....	.....	0	0	Fine	C. J. MacGregor, M. A.
*Sydney, Cape Breton	.....	.....	29. 38	746. 2	41	5. 0	93	SW.	8	3. 6	....	.....	10n	.....	S.	0. 07	27. 02	Cloudy	T. C. Hill.
*Toronto, Ontario	.....	.....	30. 19	766. 8	45	7. 2	74	NE.	3	1. 3	...	0	0	.....	.....	0	0	Clear	Magnetic Observatory.
Windsor	.....	.....	29. 58	751. 3	43. 7	6. 5	80	NW.	15	6. 7	....	.....	10n	.....	.....	0. 2	0. 5	Fair	John E. Oram.
Woodstock, Ontario	.....	.....	30. 14	765. 5	43. 4	6. 3	59	E.	18	8. 0	...	0	0	.....	.....	0	0	Clear	J. Montgomery.
SUBSERIES.																			
St. John's, Newfoundland	.....	.....	29. 98	761. 5	35. 0	1. 7	100	E.	.....	.....	....	Fog.	Fog.	.....	.....	0. 40	10. 2	Raining	John Delany.

NOTE.—The originals for Brockville, Charlottetown, Port Dover, Port Stanley, Stayner, St. John's, N. F., and those telegraphed, give the amount of cloudiness by the scale 0 to 4. The elevation of Granton is 1,015 feet, or 309.4 meters; Stratford, 1,182 feet, or 360.3 meters.

UNITED STATES SERIES.

[Furnished by the co-operation of Bvt. Brig. Gen. Albert J. Myer, Chief Signal-Officer, U. S. Army.]

Albany, N. Y	.....	.....	30. 06	763. 5	48	8. 9	54	Calm.	0	0	....	0	0	.....	.....	0	0	Clear	
Alpena, Mich	.....	.....	30. 16	766. 1	41	5. 0	65	Calm.	0	0	....	2ck	0	W.	.....	0	0	Fair	
Atlantic City, N. J	.....	.....	30. 12	765. 0	52	11. 1	53	N.	8	3. 6	....	5c	0	W.	.....	0	0	Fair	
Augusta, Ga	.....	.....	30. 05	763. 3	66	18. 9	68	Calm.	0	0	....	.....	10s	.....	.....	0	0	Cloudy	
Baltimore, Md	.....	.....	30. 16	766. 1	53	11. 7	54	N.	5	2. 2	....	5c	Sm'e	.....	.....	0	0	Fair	

Barnegat, N. J			30.09	764.3	53	11.7	48	N.	14	6.3		Haze	0			0	0	Clear
Bismarck, Dak	28.47	723.1	30.20	767.1	31	— 0.6	60	NE.	1	0.4		2cs	Haze			0	0	Clear
Boston, Mass			29.92	760.0	52	11.1	41	NW.	16	7.2		0	Haze			0	0	Clear
Breckinridge, Minn			30.22	767.6	34	1.1	79	N.	11	4.9		5ck	0	W.		0.03	0.8	Fair
Buffalo, N. Y			30.16	766.1	40	4.4	82	SW.	1	0.4		1c	0			0	0	Clear
Burlington, Vt			30.08	764.0	46	7.8	48	N.	10	4.5		0	0			0	0	Clear
Cairo, Ill			29.88	758.9	58	14.4	93	E.	10	4.5			10s			0.46	11.7	Cloudy
Campo, Cal	27.42	696.5	29.99	761.7	47	8.3	92	SW.	6	2.7			10s		SW.	0.03	0.8	Cloudy
Cape Hatteras, N. C			30.03	762.7	55	12.8	80	NE.	8	3.6		5k	2s	SW.		0	0	Fair
Cape Henry, Va			30.12	765.0	53	11.7	67	NE.	18	8.0		5k	Haze			0	0	Fair
Cape Lookout, N. C			30.07	763.8	65	18.3	83	E.	12	5.4		Haze	Haze			0	0	Fair
Cape May, N. J			30.14	765.5	50	10.0	51	NW.	12	5.4		8cs	0	W.		0	0	Fair
Charleston, S. C			30.06	763.5	69	20.6	70	S.	6	2.7		5c	2cs	W.		0	0	Fair
Cheyenne, Wyo	23.93	607.8	29.87	758.7	30	— 1.1	100	NE.	16	7.2			10n			0.09	2.3	Light snow
Chicago, Ill			30.05	763.3	50	10.0	58	NE.	5	2.2		0	Haze			0	0	Clear
Cincinnati, Ohio			30.00	762.0	55	12.8	44	E.	4	1.8			10s			0	0	Cloudy
Cleveland, Ohio			30.18	766.6	43	6.1	58	E.	5	2.2		5c	0	SW.		0	0	Fair
Corsicana, Tex			29.70	754.4	66	18.9	94	SE.	8	3.6			10s			0	0	Cloudy
Davenport, Iowa			30.04	763.0	53	11.7	72	NE.	6	2.7		4ck	6k			0	0	Cloudy
Denison, Tex			29.66	753.4	62	16.7	100	E.	15	6.7			10n		E.	1.92	48.8	Light rain
Denver, Colo	24.69	627.1	29.91	759.7	33	0.6	89	N.	5	2.2			10n			0.50	12.7	Light snow
Detroit, Mich			30.12	765.0	46	7.8	54	E.	1	0.4		5ck	5s	W.		0	0	Cloudy
Dodge City, Kans	27.21	691.1	29.48	748.8	45	7.2	100	E.	16	7.2			10n			0.09	2.3	Light rain
Dubuque, Iowa			30.05	763.3	53	11.7	60	S.	1	0.4			10s		S.	0	0	Cloudy
Duluth, Minn			30.21	767.3	41	5.0	74	NE.	8	3.6		10k	0	W.		0.01	0.3	Cloudy
Eastport, Me			29.72	754.9	45	7.2	60	N.	20	8.9		5k	0	N.		0	0	Fair
Erie, Pa			30.14	765.5	42	5.6	65	Calm.	0	0		2c	0			0	0	Fair
Escanaba, Mich			30.11	764.8	37	2.8	81	N.	8	3.6		8cs	Sm'e			0	0	Cloudy
Florence, Ariz					57	13.9		SW.				5k	0	W.		0	0	Fair
Fort Gibson, Ind. Ter			29.78	756.4	58	14.4	93	E.	3	1.3			10s			0.19	4.8	Cloudy
Fort Saint Michael, Alaska			29.95	760.7	29	— 1.7	100	NW.			2	5ck	Fog	S.		0	0	Fair
Fort Sill, Ind. Ter	28.52	724.4	29.58	751.3	63	17.2	73	E.	12	5.4		5k	0	E.		0.08	2.0	Fair
Fort Sully, Dak	28.47	723.1	30.19	766.8	37	2.8	71	NE.	11	4.9			10s			0	0	Cloudy
Galveston, Tex			29.86	758.4	67	19.4	95	SE.	2	0.9			10s		S.	1.15	29.2	Cloudy
Grand Haven, Mich			30.09	764.3	49	9.4	71	SE.	3	1.3		0	8s		W.	0	0	Cloudy
Indianapolis, Ind			30.02	762.5	53	11.7	54	NE.	7	3.1			10s			0	0	Cloudy
Indianola, Tex			29.78	756.4	72	22.2	95	SE.	6	2.7		5cs	2s	S.		0.51	13.0	Fair
Jacksonville, Fla			30.09	764.3	68	20.0	60	S.	6	2.7		10k	0	W.		0	0	Cloudy
Keokuk, Iowa			29.91	759.7	58	14.4	87	NE.	7	3.1			10s		NE.	0	0	Cloudy
Key West, Fla			30.06	763.5	72	22.2	75	SE.	4	1.8		0	0			0	0	Clear
Kittyhawk, N. C			30.12	765.0	55	12.8	87	NE.	9	4.0		8cs	0			0	0	Fair
Knoxville, Tenn			29.97	761.2	61	16.1	82	SE.	2	0.9			10s			0.01	0.3	Cloudy
La Crosse, Wis			30.09	764.3	52	11.1	66	N.	4	1.8			10s			0	0	Cloudy
Leavenworth, Kans			29.88	758.9	52	11.1	93	NE.	2	0.9			10s			0.02	0.5	Cloudy
Louisville, Ky			29.99	761.7	56	13.3	80	SE.	4	1.8			10n		S.	0.05	1.3	Light rain
Lynchburg, Va			30.14	765.5	56	13.3	62	NE.	4	1.8			10n			0.01	0.3	Light rain
Malone, N. Y			30.09	764.3	43	6.1	43	NW.	5	2.2		0	0			0	0	Clear
Marquette, Mich			30.13	765.3	37	2.8	80	NW.	12	5.4			10s			0	0	Cloudy
Memphis, Tenn			29.87	758.7	64	17.8	94	SW.	4	1.8			10s		SW.	0.79	20.1	Cloudy
Milwaukee, Wis			30.13	765.3	42	5.6	74	E.	3	1.3		10ks	Sm'e	W.		0	0	Cloudy
Mobile, Ala			30.00	762.0	70	21.1	79	S.	4	1.8		5k	0	SW.		0.01	0.3	Fair
Montgomery, Ala			30.02	762.5	65	18.3	86	S.	5	2.2			10n			0.01	0.3	Light rain

Bulletin of international meteorological observations, taken simultaneously on April 27, 1877—Continued.

UNITED STATES SERIES—Continued.

Stations.	Barometer.				Temperature of the air.		Relative humidity.	Wind.			Clouds.				Rain-fall or melted snow in the past 24 hours.		Weather.	Observer.
	Corrected for instrumental error and temperature.		Reduced to sea-level.					Direction.	Velocity.		Force.	Amount.		Direction.				
												Upper.	Lower.	Upper.	Lower.			
	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	0—10.	0—10.	From—	From—	Inches.	Millimeters.	
Morgantown, W. Va	29.05	737.9	30.12	765.0	44	6.7	67	NE.	6	2.7	....	10cs	Haze	SW.	.....	0	0	Cloudy
Mount Washington, N. H	23.52	597.4	29.88	758.9	16	— 8.9	66	NW.	48	21.5	....	0	0	.....	.....	0	0	Clear
Nashville, Tenn	.....	.....	29.91	759.7	59	15.0	87	SE.	10	4.5	....	.....	10n	.....	S.	0.28	7.1	Light rain
New Haven, Conn	.....	.....	30.04	763.0	53	11.7	46	NW.	15	6.7	....	0	0	.....	.....	0	0	Clear
New London, Conn	.....	.....	30.01	762.2	55	12.8	33	NW.	12	5.4	....	0	0	.....	.....	0	0	Clear
New Orleans, La	.....	.....	29.93	760.2	68	20.0	90	SE.	8	3.6	....	7ck	2s	W.	.....	0.10	2.5	Cloudy
Newport, R. I	.....	.....	29.97	761.2	53	11.7	43	NW.	12	5.4	....	0	0	.....	.....	0	0	Clear
New York, N. Y	.....	.....	30.10	764.5	51	10.6	51	NW.	6	2.7	....	0	0	.....	.....	0	0	Clear
Norfolk, Va	.....	.....	30.12	765.0	56	13.3	51	E.	9	4.0	...	10k	0	W.	.....	0	0	Cloudy
North Platte, Nebr	27.01	686.0	29.62	752.3	36	2.2	100	E.	.....	.....	.....	.....	10n	.....	.....	0 10	2.5	Light rain
Omaha, Nebr	28.87	733.3	29.94	760.5	50	10.0	64	NE.	10	4.5	....	8cs	0	E.	.....	Inap.	Inap.	Fair
Oswego, N. Y	.....	.....	30.17	766.3	42	5.6	71	W.	6	2.7	...	0	Haze	.....	.....	0	0	Clear
Pembina, Dak	.....	.....	30.34	770.6	30	— 1.1	89	Calm.	0	0	....	0	0	.....	.....	0	0	Clear
Philadelphia, Pa	.....	.....	30.14	765.5	51	10.6	40	N.	20	8.9	....	5c	Sm'e	NW.	.....	0	0	Fair
Pike's Peak, Col	17.44	443.0	29.65	753.1	3	—16.1	100	NE.	24	10.7	....	.....	Fog	.....	.....	0.16	4.1	Heavy snow.
Pittsburgh, Pa	.....	.....	30.13	765.3	45	7.2	60	E.	4	1.8	....	5c	Haze	NE.	.....	0	0	Fair
Port Huron, Mich	.....	.....	30.15	765.8	36	2.2	80	Calm.	0	0	....	2c	5e,sm'	.....	.....	0	0	Smoky
Portland, Me	.....	.....	29.86	758.4	50	10.0	45	NW.	15	6.7	....	0	Haze	.....	.....	0	0	Clear
Portland, Oreg	.....	.....	30.04	763.0	44	6.7	84	Calm.	0	0	....	0	0	.....	.....	0	0	Clear
Punta Rassa, Fla	.....	.....	30.08	764.0	68	20.3	72	SE.	15	6.7	....	2cs	1s	W.	.....	0	0	Fair
Rochester, N. Y	.....	.....	30.14	765.5	46	7.8	61	W.	6	2.7	....	0	0	.....	.....	0	0	Clear
Salt Lake City, Utah	25.41	645.4	29.74	755.4	48	8.9	16	NE.	26	11.6	...	5c	0	NW.	.....	0	0	Fair
Sandy Hook, N. J	.....	.....	30.09	764.3	49	9.4	63	NW.	20	8.9	....	0	0	.....	.....	0	0	Clear
San Diego, Cal	.....	.....	30.04	763.0	54	12.2	86	Calm.	0	0	....	.....	10s	.....	.....	0	0	Cloudy
San Francisco, Cal	.....	.....	30.00	762.0	53	11.7	79	W.	8	3.6	....	.....	10s	.....	.....	0	0	Cloudy
Santa Fé, N. M	23.02	584.7	29.56	750.8	29	— 1.7	78	S.	4	1.8	....	.....	10s	.....	S.	0.61	15.5	Cloudy
Savannah, Ga	.....	.....	30.07	763.8	73	22.8	54	SW.	7	3.1	....	2c	2s	N.	.....	0	0	Hazy
Shreveport, La	.....	.....	29.88	758.9	65	18.3	94	SE.	7	3.1	....	.....	10n	.....	SE.	Inap.	Inap.	Light rain

Smithville, N. C	.....	.....	30.03	762.7	66	18.9	78	SW.	6	2.7	...	.....	10s	.....	SW.	0	0	Cloudy	
Springfield, Mass	.....	.....	30.03	762.7	54	12.5	43	N.	8	3.6	...	0	0	.....	.....	0	0	Clear	
Saint Louis, Mo	.....	.....	29.90	759.4	56	13.3	63	NE.	8	3.6	...	.....	10s	.....	.....	0	0	Cloudy	
Saint Mark's, Fla	.....	.....	30.06	763.5	64	17.8	88	S.	6	2.7	...	0	5s	.....	S.	0	0	Fair	
Saint Paul, Minn	.....	.....	30.07	763.8	52	11.1	65	SW.	10	4.5	...	.....	10s	.....	.....	0	0	Cloudy	
Saint Paul's Island, Alaska	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	
Stanwix, Ariz	.....	.....	.....	.....	55	12.8	...	SW.	.....	.....	...	0	Haze	.....	.....	0	0	Hazy	
Thatcher's Island, Mass	.....	.....	29.91	759.7	50	10.0	51	NW.	16	7.2	...	0	0	.....	.....	0	0	Clear	
Toledo, Ohio	.....	.....	30.12	765.0	52	11.1	53	E.	2	0.9	...	2cs	Haze	W.	.....	0	0	Fair	
Tucson, Ariz	27.48	698.0	30.03	762.7	43	6.1	...	SE.	.....	.....	...	0	5ks	.....	W.	0	0	Fair	
Tybee Island, Ga	.....	.....	30.05	763.3	68	20.0	75	S.	6	2.7	...	5ck	Haze	SW.	.....	0	0	Fair	
Vicksburg, Miss	.....	.....	29.92	760.0	64	18.1	100	S.	6	2.7	...	.....	10s	.....	SW.	0.03	0.8	Cloudy	
Virginia City, M. T	24.26	616.2	29.74	755.4	31	— 0.6	60	SE.	4	1.8	...	1c	0	N.	.....	0	0	Clear	
Washington, D. C	.....	.....	30.17	766.3	53	11.7	48	NE.	8	3.6	...	8cs	Sm'e	W.	.....	0	0	Fair	
Wilmington, N. C	.....	.....	30.02	762.5	66	18.9	83	Calm.	0	0	...	10cs	Haze	NW.	.....	0	0	Dense haze .	
Wood's Holl, Mass	.....	.....	29.95	760.7	55	12.8	55	NW.	9	4.0	...	0	2s	.....	NW.	0	0	Fair	
Yankton, Dak	28.81	731.6	30.12	765.0	43	6.1	91	NE.	3	1.3	..	.....	10n	.....	.....	0.66	16.8	Light rain ..	
Yuma, Ariz	.....	.....	29.92	760.0	56	13.3	....	W.	.....	.....	...	0	0	.....	.....	0	0	Clear	

UNITED STATES SUBSERIES.

Kingston, Jamaica, W. I	.....	.....	30.17	766.3	77	25.0	82	Calm.	0	0	...	5ck	2n	.....	.....	0.09	2.3	.....	James Gall.
Navassa, W. I	.....	.....	.....	.....	79	26.1	....	NNE.	.....	.....	3	.....	.....	.....	.....	0	0	.....	Dr. G. H. Davison.
Clifton, Ja., W. I	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	C. Partridge.
Paramaribo, D. Guiana, S. A	.....	.....	29.97	761.2	81	27.2	87	E.	.....	.....	2	5k	5ks	E.	.....	2.060	52.32	Cloudy	C. J. Hering.
Batavia, Dutch Guiana, S. A	30.03	762.7	.....	.....	79.7	26.5	...	E.	.....	.....	...	.....	.....	.....	.....	1.220	31.00	Clear	Dr. H. Groot.
Medellin, Colombia, S. A	25.24	641.1	.....	.....	70.0	21.1	78	Calm.	.....	.....	0	1cs	5ks	.....	.....	0.66	16.8	Cloudy	Thomas Herran.
York Factory, B. A	.....	.....	30.31	769.9	8.5	—13.1	89	N.	22	9.8	....	3k	0	S.	.....	.....	.....	Fair	J. Fortescue, W. Wood.
Honolulu, Oahu, H. I	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	Daniel Smith.
Makawao, Maui, H. I	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	F. L. Clarke.

NOTE.—The originals give the amount of cloudiness by the scale 0 to 4, except York Factory, Makawao, Medellin, and Paramaribo. The elevation of the barometer at Bismarck is 1,677 feet, or 511.1 meters; Campo, 2,486 (?) feet, or 757.8 (?) meters; Cheyenne, 6,057.3 feet, or 1,886.2 meters; Clifton, about 2,892 feet, or 881.5 meters; Denver, 5,135 feet, or 1,565.2 meters; Dodge City, 2,486 feet, or 757.8 meters; Fort Sill, 1,100 (?) feet, or 335.3 (?) meters; Fort Sully, 1,678 (?) feet, or 511.4 (?) meters; Florence, 1,550 (?) feet, or 472.5 (?) meters; Makawao, 2,205 feet, or 672.1 meters; Morgantown, 1,027.9 feet, or 313.3 meters; Medellin, 4,876 feet, or 1,486.2 meters; Mount Washington, 6,285 feet, or 1,915.6 meters; North Platte, 2,846 feet, or 867.4 meters; Omaha, 1,054.6 feet, or 321.4 meters; Pike's Peak, 14,150.7 feet, or 4,313.1 meters; Salt Lake City, 4,362.2 feet, or 1,329.6 meters; Santa Fé, 6,862.2 (?) feet, or 2,091.6 (?) meters; Tucson, 2,545 (?) feet, or 775.7 (?) meters; Virginia City, 5,480 (?) feet, or 1,670.3 (?) meters; Yankton, 1,278 feet, or 389.5 meters. The following constants are added in correcting the barometric observations for altitude: Campo, 2.57 inches; Cheyenne, 5.94 inches; Denver, 5.22 inches; Florence, 1.61 inches; Makawao, 2.17 inches; Mount Washington, 6.36 inches; Pike's Peak, 12.21 inches; Salt Lake City, 4.33 inches; Santa Fé, 6.54 inches; Tucson, 2.59 inches; Virginia City, 5.48 inches. The elevation of Batavia is about 6 feet; the barometric readings need the addition of 0.2 millimeter, or 0.01 inch, for reduction to sea-level. The instrumental error of the barometer at Medellin is not known. It is not certain that the weather for Batavia refers to the moment of observation.

Bulletin of international meteorological observations, taken simultaneously on April 27, 1877, &c.—Continued.

UNITED STATES NAVAL SERIES.

[By authority of the Secretary of the Navy. Furnished by the co-operation of the Navy Department, through Commodore Daniel Ammen, U. S. N., Chief of Bureau of Navigation.]

Stations and vessels.	Barometer.				Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rain-fall or melted snow in the past 24 hours.		Sea-swell.		Weather.	Observer.
	As reported.*		Attached thermometer.					Direction.	Velocity.		Force.	Amount.		Direction.							
												Upper.	Lower.	Upper.	Lower.						
	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	0—10.	0—10.	From—	From—	Inches.	Millimeters.	Character.	Direction from—		
Naval Hospital (Annapolis, Md.)	30.23	767.8	65	18.3	52	11.1	54	N.	....	....	2	....	7	....	....	0	0	.....	.....	Cloudy.....	
Navy Yard (Mare Island, Cal.)...	30.04	763.0	57.5	14.2	52	11.4	....	SW.	....	....	1	....	3	....	NW.	0	0	.....	.....	Pleasant....	
Navy Yard (Norfolk, Va.)	30.22	767.6	54	12.2	55	12.8	62	ENE.	8	3.6	....	....	8ck	....	.....	0	0	.....	.....	D. clouds ...	
Navy Yard (Pensacola, Fla.)	30.13	765.3	.....	.....	69	20.6	85	SE.	7	3.1	....	....	4	....	SE.	0	0	.....	.....	D. clouds ...	
Navy Yard (Portsmouth, N. H.)	30.20	767.1	64	17.8	50	10.0	72	NW.	10	4.5	....	....	....	....	.....	0	0	.....	.....	Clear	
Naval Hospital (Yokohama, Japan).	29.96	761.0	65	18.3	60	15.6	94	SW.	....	....	2	....	8s.	....	N.	0.08	2.0	.....	.....	Light rain ..	
Adams (N. 36° 11′, W. 62° 40′)...	29.85	758.2	65	18.3	68	20.0	84	W.	....	....	3	....	4	....	NW.	.....	.....	Moderate.	W.	D. clouds ...	
Alert (Yokohama, Japan)	30.22	767.6	63	17.2	69†	0.62	....	SE.	....	....	2-5	....	10	....	SE.	.....	.....	Calm ..	None	Raining.....	
Alliance (N. 42° 16′, E. 10° 24′)...	29.92	760.0	66	18.9	62	16.7	61	S.	....	....	2	....	6	....	.....	.....	.....	Calm .	None	Pleasant....	
Ashuelot (Pak-hoi, China)	29.86	758.4	.....	.....	76	24.4	95	ENE.	....	....	4	....	10	....	ENE	.....	.....	Smooth	.....	D. clouds ...	
Canonicus (New Orleans, La.) ...	29.91	759.7	50	10.0	68	20.0	90	SE.	....	....	2	....	8	....	S&E.	.....	.....	.....	.....	Cloudy.....	
Colorado (New York, N. Y.)	30.10	764.5	55	12.8	53	11.7	67	NW.	14	6.3	....	....	3	....	.....	0	0	.....	.....	D. clouds ...	
Essex (Vera Cruz, Mexico)	29.81	757.2	80	26.7	82	27.8	91	SSE.	....	....	1	....	4	....	.....	0	0	Moderate.	E.	D. clouds ...	
Frolic (Monte Video, Uruguay)..	30.11	764.8	.....	.....	60	15.6	88	S.	....	....	4	....	6k	....	.....	Blank	Blank	Heavy	S.	D. clouds ...	
Gettysburg (Chanak Kalessi, Turkey).	29.84	757.9	.....	.....	68	20.0	....	SSW.	....	....	1	....	10	....	.....	0	0	Calm ..	None	D. clouds ...	
Hartford (Bridgetown, Barbadoes, W. I.).	30.15	765.8	82	27.8	83	28.3	79	NE.	3.6	1.6	....	....	4	....	W.	.....	.....	.....	.....	Pleasant....	
Huron (Cumana, Venezuela)....	30.09	764.3	81	27.2	81	27.2	87	ESE.	....	....	2	....	8	....	.....	.....	.....	.....	.....	D. clouds ...	
Kearsarge (Nagasaki, Japan)...	29.99	761.7	.....	.....	65	18.3	94	Calm.	....	....	0	....	10	....	.....	Blank	Blank	Calm .	None	Misty.....	
Lackawanna (Pichilinque Bay, Mexico).	30.05	763.3	.....	.....	65	18.3	84	SSE.	....	....	2	....	0	....	.....	.....	.....	Smooth	.....	Blue sky....	

Marion (N. 41° 58′ 00″, E. 10° 28′ 50″).	29.83	757.7	64	17.8	58	14.4	100	ENE.			1		9			Blank	Blank	Smooth		D. clouds
Michigan (Erie, Pa.)	29.63	752.6	49	9.4	43	6.1	67	E.			1		0							Clear
Monocacy (Nankin, China)	29.70	754.4			68	20.0	90	SW.			1-2		10		S&W.	Blank	Blank	Calm	None	D. clouds
Monongahela (Baltimore, Md.)	30.19	766.8	54	12.2	68	20.0		N.			1		c			0	0			Hazy
New Hampshire (Port Royal, S. C.).	30.28	769.1			68	20.0	84	SW.			1		6		NW.	0	0			D. clouds
Omaha (Panama)	30.04	763.0	79	26.1	79	26.1	86	NW.	1	0.4			6		S.	0	0	Smooth		Hazy
Osaipee (N. 20° 22′, W. 74° 10′ 30″)	30.11	764.8	76	24.4	76	24.4	73	NNE.			5		3		NE.			Long	NE.	D. clouds
Palos (Shanghai, China)	29.84	757.9			64	17.8	100	SSW.			3		10		S&W.					Raining
Pensacola (N. 13° 43′, W. 91° 31′)	30.01	762.2			85	29.4	79	SE.			1		7		N.	0	0	Moderate.	S.	Pleasant
Plymouth (Vicksburg, Miss)	29.88	758.9	71	21.7	65	18.3	89	SE.			3		10			0	0			Overcast
Ranger (N. 38° 17′, W. 61° 17′)	29.92	760.0			62	16.7	86	WNW.			4-5		5		N&W			Moderate.	N.	Cloudy
Richmond (Monte Video, Uruguay).	30.10	764.5	62.0	16.7	59.5	15.3	84	SSW.			4		3		SSW.	Blank	Blank	Irregular.	SE.	D. clouds
Rio Bravo (Matamoras, Mexico)	29.64	752.8			72	22.2	90	E.			4		3		S.					D. clouds
Santee (Annapolis, Md.)	30.22	767.6	64	17.8	55	12.8	44	NW.			2		9							Cloudy
Saint Louis (League Island, Pa.)	30.06	763.5	59	15.0	53	11.7	61	NNW.	6	2.7			6		NW.	0	0			Fair
Swatara (Aspinwall, Panama)	29.98	761.5	81	27.2	81	27.2	91	NNE.			1		2k					Moderate.	NNE.	D. clouds
Tennessee (Yokohama, Japan)	29.97	761.2	68	20.0	65	18.3	89	SSE.			3		10		S.			Smooth		Raining
Vandalia (N. 37° 42′, E. 24° 19′)	29.86	758.4	66	18.9	65	18.3	89	NE.			3		10		E.					D. clouds
Wabash (Boston, Mass.)	29.95	760.7	54	12.2	52	11.1	79	NW.	12	5.4			0			0	0			Hazy
Wyoming (Washington, D. C.)	30.48	774.2	58	14.4	64	17.8		NE.			1		5							Hazy

NOTE.—The originals generally give the wind-force by the scale 0 to 12, and the weather by the Beaufort notation; the distinction between the amount of upper and lower clouds is not made, and, apparently, the direction is frequently given as toward, instead of from; they do not give the humidity.

* It is not known that the barometer is corrected for temperature, instrumental error or elevation.

† Aneroid barometer.

‡ Barometer corrected for instrumental error and reduced to sea-level.

Bulletin of international meteorological observations, taken simultaneously on April 27, 1877, &c.—Continued.

UNITED STATES MARINE SERIES.

REPORTED TO THE OFFICE OF THE CHIEF SIGNAL-OFFICER OF THE ARMY.

PACIFIC MAIL STEAMSHIP COMPANY MARINE SERIES.

[Furnished by the co-operation of —— ——, president; Williams, Blanchard & Co., agents.]

Names of vessels.	True course toward—	Hourly rate in knots.	Barometer reduced to sea-level.		Temperature of the air.		Relative humidity.	Wind.				Clouds.				Sea-swell.		Weather.	Observer.
								Direction.	Velocity.		Force.	Amount		Direction.					
												Upper.	Lower.	Upper.	Lower.	Character.	Direction from—		
			Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	0—10.	0—10.	From—	From—				
Steamship Alaska	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Capt. Seabury.
Steamship City of Peking (N. 32° 42′, E. 134 21′).	.....	...	29.96	761.0	68	20.0	90	WSW.	....	....	4	....	2k	....	.....	Moderate.	WSW.	D. clouds ...	Lt Z. L. Tanner, U.S.N.
Steamship Colima	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Capt. Searle.
Steamship Georgia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Capt. Cavarly.

NOTE.—The originals give the wind force by the scale 0 to 12, and weather by the Beaufort notation; not any distinction between upper and lower clouds. It is not known that the barometer is corrected for temperature, instrumental error or elevation.

OCCIDENTAL AND ORIENTAL STEAMSHIP COMPANY MARINE SERIES.

[Furnished by the co-operation of George H. Bradbury, president; T. H. Goodman, agent.]

Steamship Belgic	.....	...	.....	.....	.....	.....	...	.....	....	....	...	....	....	...	.....	.....	.....	.....	Capt. John Metcalf.
Steamship Gaelic	.....	...	.....	.....	.....	.....	...	.....	....	....	...	....	....	...	.....	.....	.....	.....	Capt. W. H. Kidley.
Steamship Oceanic	.....	...	.....	.....	.....	.....	...	.....	....	....	...	....	....	...	.....	.....	.....	.....	Capt. H. Parsell.

NORTH GERMAN LLOYD OF BREMEN MARINE SERIES.

[Furnished by the co operation of A. Schumacher & Co., agents.

Steamship Baltimore																				Capt. H. Andressen.
Steamship Berlin, N. 43° 42', W. 44° 29'.	NE by E ½ E	9.5	30.01	762.2	56.8	13.8		SE			3		k		SSE	Tranquil.		D. clouds		Capt. C. Pohle.
Steamship Braunschweig																				Capt. K. Undütsch.
Steamship Nürnberg																				Capt. A. Jaeger.
Steamship Ohio																				Capt. G. Meyer.

NOTE.—The originals give the barometer as read off; temperature, by Réaumur scale; wind-force, by scale 0 to 12; weather, as published; generally do not give amount of cloudiness, nor distinguish between upper and lower clouds.

AMERICAN STEAMSHIP COMPANY MARINE SERIES.

[Furnished by the co-operation of H. D. Welsh, president; Peter Wright & Sons, general agents.]

Steamship Illinois																				Capt. Shackelford.
Steamship Indiana																				Capt. Sargent.
Steamship Ohio																				Capt. Morrison.
Steamship Pennsylvania																				Capt. Harris.

NOTE.—The originals give the barometer as read off; the wind-force by the scale of 12.

MARINE SERIES. (Miscellaneous.)

[Furnished by the co-operation of the observer named.]

Schooner Addie Fuller, Providence, R. I.			29.91	759.7	59	15.0	48	NW				0	0					Clear		Capt. Jas. Jorgensen.

NOTE.—The schooner Addie Fuller gives the amount of cloudiness by the scale 0 to 4.

Collated at the office of the Chief Signal-Officer of the Army, Washington, D. C.

The records which appear in this bulletin are copied from the regular exchanges of this office, made in each instance in compliance with an especial request and are published for the uses of the co-operating observers. The barometric readings in the first two columns are reduced to freezing and their respective standards; those in the second two also to mean sea-level. For United States marine series the correction for instrumental error and the reduction to sea level have been applied whenever they could be ascertained by means of reliable comparisons, made when the vessel was at or near land stations. The "weather" is generally published as given; D. clouds for detached clouds. When the distinction between the upper and lower strata of clouds is not reported, the *kinds* or *types*, viz: cirrus, cumulus, stratus, nimbus, scud, fracto, pallio, haze, fog and smoke, as indicated, respectively, by the letters c, k, s, n, d, f, p, hz., fg., and sm'e, are generally published with the amount in the lower-cloud column. The distinction between the upper and lower strata is carefully made in the United States series and a portion of the Canadian series, and the types are indicated by the above letters or their combinations in the proper column.

ALBERT J. MYER,
Brigadier General, (Brevet Assigned,) Chief Signal-Officer, U. S. A.

PAPER 26.

MONTHLY WEATHER REVIEW, JULY, 1876.

INTRODUCTION.

The following is a general summary of the meteorological data collected in the office of the Chief Signal-Officer of the Army during the current month. The regular tri-daily charts, containing the data of the simultaneous observations taken at ninety-two regular and thirty-eight special signal-service stations, and fourteen Canadian stations, have been carefully examined, together with monthly journals and monthly reports from four hundred and ten stations classified as voluntary observers, Army post, and Signal-Service Stations.

These stations are geographically distributed as follows: Alabama, five; Arizona, ten; Arkansas, four; California, three; Colorado, five; Connecticut, five; Dakota, six; Delaware, two; District of Columbia, one; Florida, seven; Georgia, ten; Illinois, twenty; Indiana, eleven; Indian Territory, one; Iowa, twenty; Kansas, fifteen; Kentucky, six; Louisiana, five; Maine, eleven; Maryland, nine; Massachusetts, twenty; Michigan, thirteen; Minnesota, eight; Mississippi, four; Missouri, five; Montana, two; Nebraska, nine; Nevada, one; New Hampshire, eleven; New Jersey, twelve; New York, thirty-six; North Carolina, seventeen; Ohio, twenty-one; Oregon, one; Pennsylvania, twenty-three; Rhode Island, two; South Carolina, three; Tennessee, seven; Texas, fourteen; Utah, two; Vermont, six; Virginia, sixteen; West Virginia, three; Wisconsin, ten; Wyoming Territory, two.

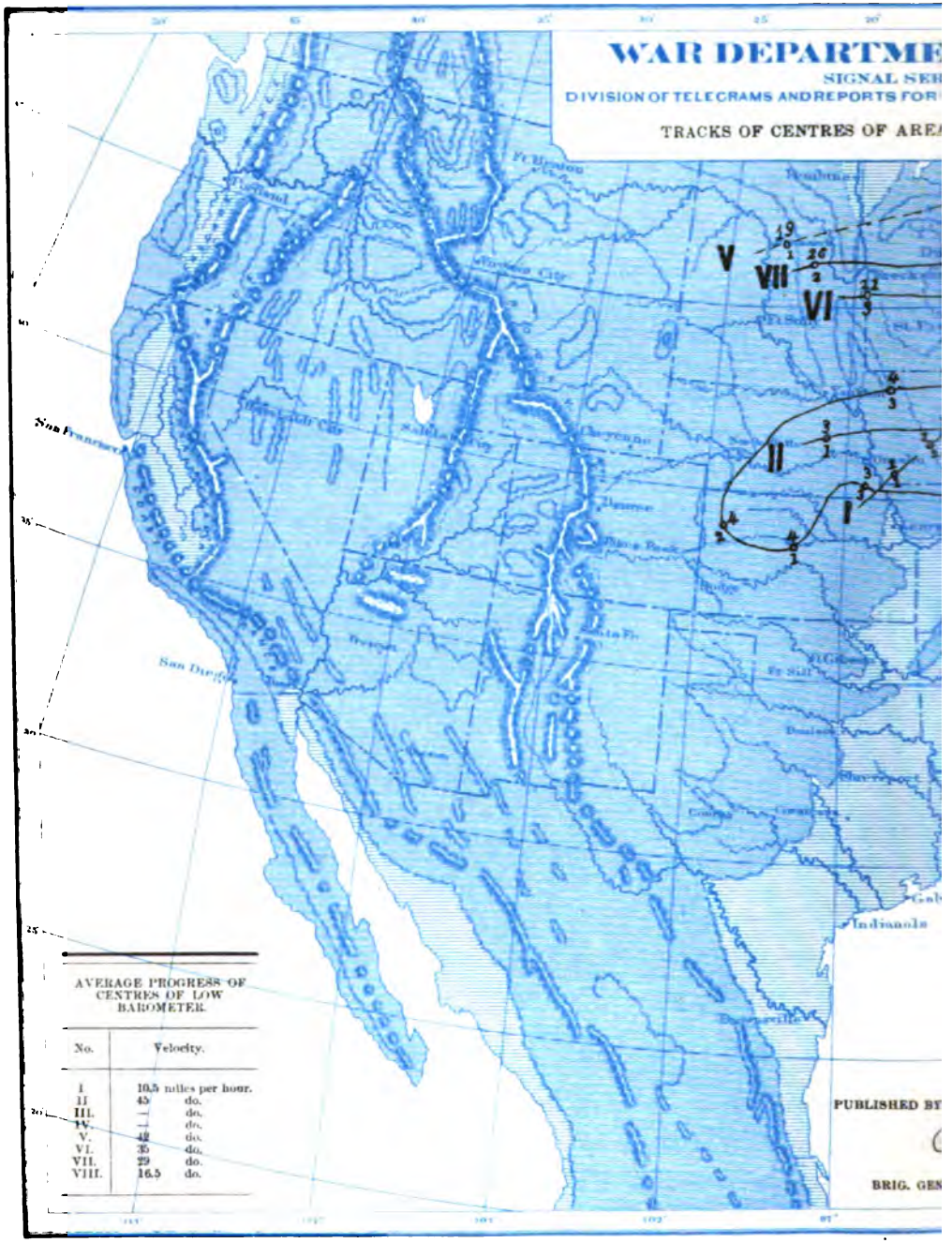
In comparing these records with those of a corresponding period of previous years, the most marked conditions are: 1. The continued high temperature during the greater portion of the month throughout the United States east of the Rocky Mountains, the heat in many places becoming so intense as to produce fatal results, to cause the suspension of business, and an increase of the death rate of many of the large cities to the highest reported percentage. 2. The absence of well-defined barometric depressions, the excess of pressure on the South Atlantic coast and in the Gulf States. 3. The destructive tornadoes which occurred in Iowa on the night of the 4th, attending the depression marked as No. II on the storm-chart. 4. The floods in the Red River, which were very destructive to the cotton crop between the Red River Raft and Fulton.

The month has proved generally favorable to the agricultural interests of the country, although local droughts occurred in the Middle States, followed at the close of the month by an excess of rain. The heavy rains in the South Atlantic States and in the Missouri and Ohio Valleys resulted in destructive floods, which injured the growing crops on the bottom lands. Reports from over two hundred stations in Indiana, Illinois, Kentucky, and Tennessee, show that heavy rains in these regions have reduced the grain crops below the average.

BAROMETRIC PRESSURE.

In general.—The mean barometric pressure of the month is shown by the black lines on Chart No. II, from which it will be seen that the area of mean high barometer is now located near the southeastern portion of the United States, the isobar of 30.05 extending as far west as the Mississippi River. Compared with the preceding month, this chart shows an advance of this area to the west, while in previous years the pressure has continued lower during July in the southern portion of the country. This increase of pressure, considered with reference to the distribution of pressure in the northern portions, favored the continued flow of air to the regions of low barometer, and will account for the mean direction of wind at the several stations, as indicated by the arrows on the chart. The region of mean low barometer continues near the center of the continent, with a slight increase of pressure over that of the previous month. Considering the whole chart, there has been an apparent atmospheric movement from the Atlantic coast to the westward, except in New England. The distribution of pressure on the Pacific coast continues as in the previous month, the mean at Portland, Oreg., being 30.06, while at San Francisco and San Diego no change has occurred. The barometric range has, as usual, increased with the latitude, the greatest being at Pembina, 1.54 inches, Bismarck, 0.91; North Platte, 0.83; Duluth, 0 80; Saint Paul, 0.70, and the smallest, Key West, 0.19; San Diego, 0.25; Galveston, 0.28; Memphis, 0.32; Nashville and Cairo, 0.33.

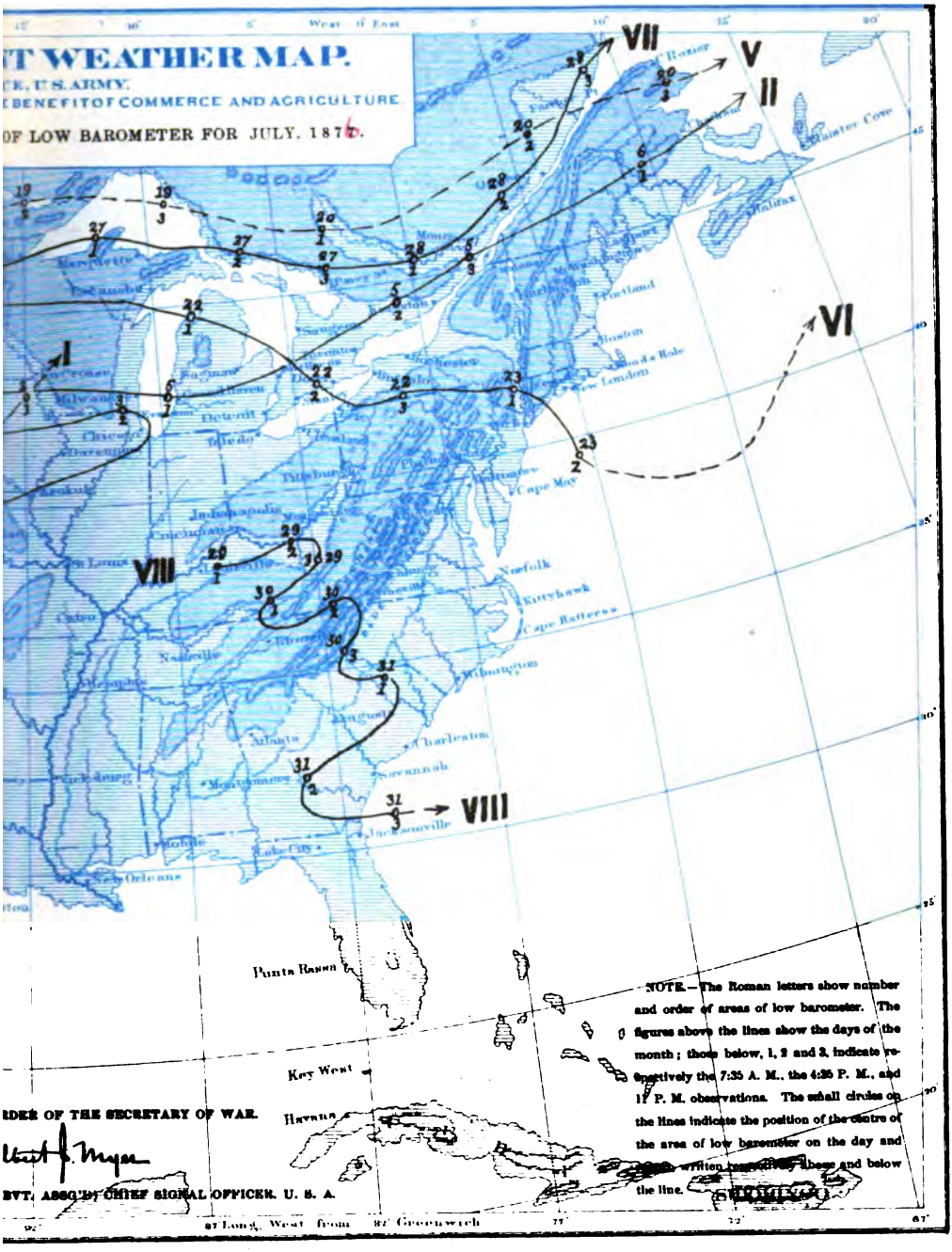
Areas of high pressure, No. I.—This extended area continued central near the South Atlantic coast from the 1st to the afternoon of the 7th, when it passed to the south of this region, causing a general decline of pressure on the Atlantic coast, and an increase in the Lower Mississippi Valley. During the 8th, 9th, and 10th this area disappeared to the south of the Gulf coast, but the pressure continued sufficiently high to cause a continuance of the warm and dry south and southwest winds at the stations to the



AVERAGE PROGRESS OF CENTRES OF LOW BAROMETER.

No.	Velocity.
I.	10.5 miles per hour.
II.	45 do.
III.	— do.
IV.	— do.
V.	42 do.
VI.	35 do.
VII.	29 do.
VIII.	16.5 do.

No. I.


T WEATHER MAP.
CE, U.S. ARMY,
E BENEFIT OF COMMERCE AND AGRICULTURE
OF LOW BAROMETER FOR JULY, 1876.
VII
V
II
VI
I
VIII
VIII
Halifax
Portland
Boston
Cape May
Norfolk
Kittyhawk
Cape Hatteras
Wilmington
Charleston
Savannah
Punta Rassa
Key West
Havana
NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:35 A. M., the 4:35 P. M., and 11 P. M. observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and hour written immediately above and below the line.
ORDER OF THE SECRETARY OF WAR.
BVT. ASST. SURGEON CHIEF SIGNAL OFFICER, U. S. A.
87 Long. West from 87 Greenwich

east of the Alleghanies. The retarded movement of this area on the southern coast, with occasional partial depressions in the northwest, accompanied the high temperature which continued uninterruptedly until the distribution of pressure was changed by the advance of an area of high barometer from the northwest on the 13th. On the morning of the 10th the pressure had increased in the Upper Lake region and the northwest with cooler northerly winds and local rains, and, during the day, this increase gradually extended toward the coast, resulting in the formation of a second area over the Southern States. This second high pressure on the coast continued almost stationary until the 13th, and disappeared during the 14th and 15th to the south of the Gulf coast.

No. II. The afternoon telegraphic reports of the 13th, indicated the advance of this area from the region west of Hudson's Bay, and by midnight of the 14th the temperature had fallen in the entire Lake region. This area moved toward the middle Atlantic coast and thence southwestward over the Southern States, but was accompanied by only a temporary depression of temperature.

No. III was observed in the region north of Fort Garry on the afternoon of the 20th, the barometer at this station reading 30.18. It moved rapidly over the Lake region to the Atlantic as an area of 30.10, and disappeared in advance of the depression marked as No. VI on the chart.

No. IV approached from the extreme northwest on the 21st, and continued central in this region until the 25th. Although there is no well-defined movement of the area from the northwest to the coast, its presence is indicated by the gradual increase of pressure over the districts east of the Mississippi during the 26th and 27th. The study of the movements of this area is more interesting, as it accompanied the final interruption of the protracted term of high temperature.

Areas of low-pressure, No. I.—This depression was referred to in the June review as No. VII, and partially described. On the morning of the 1st it was central in Northern Missouri, and the region of heavy local rains had extended eastward over Lake Erie and the States north of the Ohio Valley. The isobars of the succeeding charts show an advance toward the coast, while the central area continued almost stationary in the northwest. The track given on the chart is only an approximation of the movement, which at no time was well-defined. A second depression devoloped in the extreme northwest, and apparently passed north of the Lake region during the 2d and 3d, accompanied by light rains. Reports from the stations west of the Mississippi indicated that this storm developed near the east slope of the Rocky Mountains, as severe local storms were reported in the regions south of the Platte and Missouri Rivers. Disastrous freshets occurred in the streams crossed by the Iron Mountain Railroad and in the Indian Territory, causing delay in trains.

No. II is first noted on the chart as central near the mouth of the Platte River on the morning of the 3d, and advanced during the succeeding eight hours to Northern Illinois, accompanied by local storms; those in the Missouri Valley being most severe, and in some cases unroofing houses. The midnight report of the 3d shows no well-defined atmospheric movements, and that the region of lowest pressure had apparently receded to the Missouri Valley, while the rain-area had extended from the Lower Lake region to the Ohio Valley. The pressure continued low in the Missouri Valley on the 4th, with a gradual movement towards the northern portion of Iowa, where it was central at midnight. Tornadoes occurred in the southeast quadrant of this depression, in the counties of Lee, Davis, Van Buren, Clark, Lucas, Appanoose, Harrison, Delaware, Jones, Linn, and Cedar, causing great loss of life and serious injury to crops. The storm was particularly severe at Dubuque, and at Rockdale thirty-nine persons were drowned by a flood in the small stream upon which the village is located. Further reports show that this storm extended southward into Missouri during the 4th and 5th. Over four inches of rain fell at Keokuk, causing floods in the Des Moines River. On the morning of the 5th this storm was central near Chicago, with a well-defined circular area of 29.60, two hundred miles in diameter; the wind had shifted to the north and northwest at Milwaukee and Chicago, with increasing force, and light east to south winds continued in the eastern portion of the Lake region. The P. M. reports of the 5th show a rapid advance of the center to the east, accompanied by violent gales and heavy rains on the Lower Lakes, and a tornado in the valley of the Alleghany. This storm proved particularly severe at Erie and Buffalo, and, after the wind veered to the west, the water in the eastern portion of Lake Erie rose five feet above the mean. The progressive movement of this depression was less rapid over the Lakes and the Saint Lawrence Valley, but increased after passing over Northern New England. Heavy gales were reported in the Saint Lawrence Valley and east of Nova Scotia on the 5th.

No. III.—This depression is not traced upon the chart, as its track passed north of the Lake region from the 5th to the 9th, accompanied by warm and generally clear weather east of the Mississippi, except a very heavy local rain in the Central Ohio Valley, and a severe wind-storm near Macon, Ga., on the 6th. Local rains continued in the Northwest, and there was a gradual decline in the barometer in the eastern dis-

tricts on the 10th, accompanied by a corresponding rise in the Northwest. The local rains due to the sudden shifting of the winds produced only slight changes in the unusually high temperature.

No. IV.—A partially defined depression in the Lower Missouri Valley on the morning of the 13th, which moved eastward during the day as an area of rain, extending over the States of the Ohio Valley, Virginia, and Pennsylvania. The barometer continued to fall in the eastern districts, but the central depression became so extended and ill-defined as to render its movements uncertain and without special interest. Severe local storms and heavy rains occurred in Tennessee, North Carolina, Virginia, and the Ohio Valley during the 13th and 14th. Freshets occurred in the Upper Ohio River near Pittsburgh and in Middle and Southern Ohio, causing damage to crops, fencing, railways, &c.

No. V.—Approached gradually from the extreme Northwest during the 17th and 18th, and was marked central near Bismarck on the morning of the 19th. The track of this depression is shown by the dotted line upon the chart passing to the north of the Lakes. The center of this depression was so far to the north as to render it impossible to accurately trace its movements. On the 20th the belt of light rain extended as far south as the Gulf States, and as the depression approached the Saint Lawrence Valley the disturbance increased along the Atlantic coast, the winds shifting to westerly, with a sudden fall in temperature. On the night of the 20th, a violent tornado occurred in the vicinity of Richmond, Va., but numerous reports show that, although severe, it was entirely local in its nature. Numerous storms occurred during the night of the 20th, in Pennsylvania and New Jersey, one specially noted at Philadelphia.

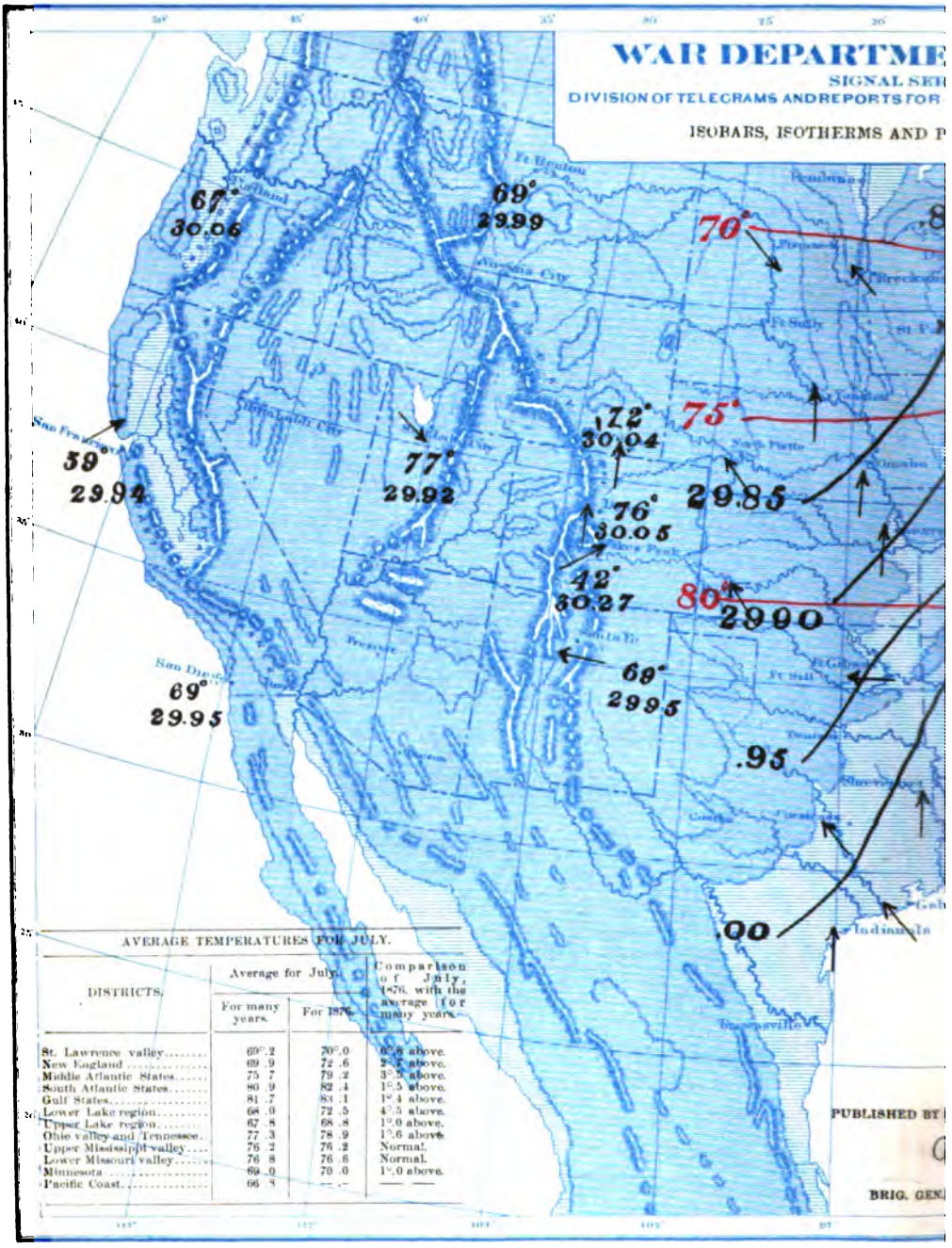
No. VI.—At midnight on the 21st this depression was central south of Breckenridge, and during the preceding eight hours the barometer had risen rapidly at Pembina with a decided fall of temperature; the region of high temperature and southerly winds extended southward to the Gulf coast and westward over the Territories. During the succeeding eight hours the central area passed rapidly east to the northern portion of Lake Michigan, accompanied by heavy rains and brisk winds at the northern stations. At Alpena the wind had increased to a velocity of twenty-eight miles per hour from the south, and to the west of Michigan the barometer had risen rapidly, with cooler, northerly winds, which gradually extended over the districts east of the Mississippi, as this depression advanced to the coast. After reaching Lake Michigan the course changed to the southeast and so continued until the storm passed beyond the limits of our stations. As the disturbance moved eastward the isobar of 29.90 became more extended and the barometer fell below 29.80 at the stations between Wilmington and Portland, Me. Heavy rains occurred as far south as Wilmington and on the immediate coast to the north, where the winds increased to brisk, and, in some cases, high, after veering to the northwest.

No. VII was at no time within the limits of the stations, but passed eastward, following the general course of the Lakes and Saint Lawrence Valley, accompanied by heavy rains in the Ohio Valley, Tennessee, and thence eastward to the coast. Marine reports show that dangerous winds occurred on the Lower Lakes on the 27th, and on the Middle and East Atlantic coasts on the 28th. Cautionary signals were ordered for the Lake ports and on the Atlantic coast from Wilmington to Eastport, but they were not generally justified at the stations.

No. VIII.—This depression, although slight, apparently developed in the Ohio Valley, while a second depression was central west of the Mississippi and south of the Missouri. A tornado occurred near Saint Louis, Mo., on the morning of the 28th, extending over an area of twenty miles, and proving destructive to crops and buildings. The record of the wind-velocity at the Saint Louis station shows the proximity of this disturbance, and that it was of a local character. The region of rain gradually extended to the east and south, with no decided change in the barometer, and a greater portion of the rain of the month fell at the stations in the Middle Atlantic States and near the New England coast on the 29th, 30th, and 31st, while this depression moved southeastward, and passed off the South Atlantic coast.

TEMPERATURE OF THE AIR.

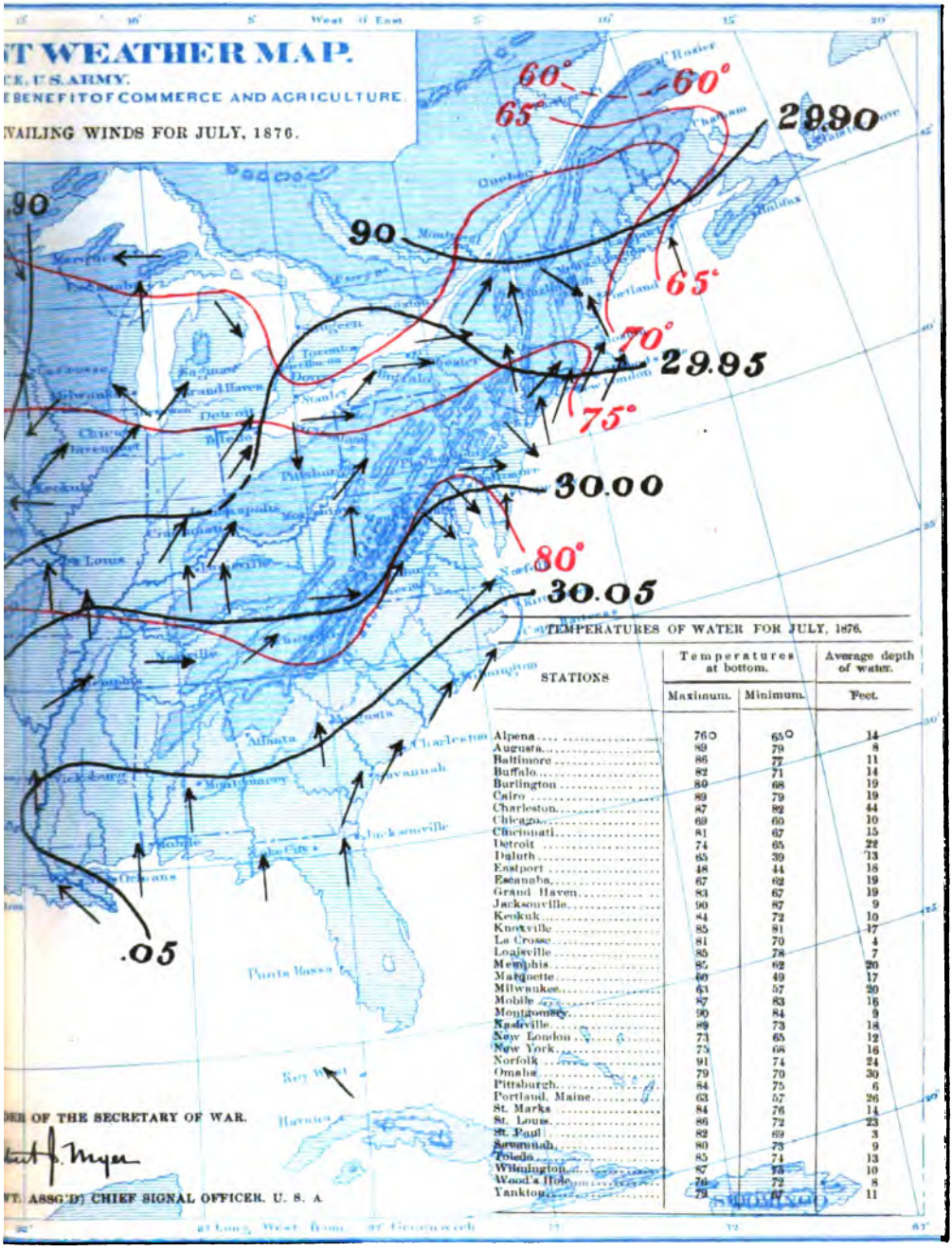
In general.—The temperature has averaged high during the month, especially in the districts east of the Mississippi, and was in no case below the normal, except on the Pacific coast. Comparing Chart No. II with that of the previous month, it will be seen the isothermal line of 80° has moved north from the Gulf coast, and approximately follows the 37th parallel between the Alleghany Mountains and the eastern slope of the Rocky Mountains. East of the Alleghanies this line follows the course of the range to the head of the Chesapeake Bay. The isothermal lines of 75° and 70° are deflected to the north as they approach the coast, the latter including within its area a greater portion of the Saint Lawrence Valley. The influence of the ocean temperature is well marked in the higher latitudes on the eastern coast by the sudden



AVERAGE TEMPERATURES FOR JULY.

DISTRICTS.	Average for July.		Comparison of July, 1876, with the average for many years.
	For many years.	For 1876.	
St. Lawrence valley	69°.2	70°.0	0°.8 above.
New England	69 .9	72 .6	2°.7 above.
Middle Atlantic States	75 .7	79 .2	3°.5 above.
South Atlantic States	80 .9	82 .4	1°.5 above.
Gulf States	81 .7	83 .1	1°.4 above.
Lower Lake region	68 .0	72 .5	4°.5 above.
Upper Lake region	67 .8	68 .8	1°.0 above.
Ohio valley and Tennessee	77 .3	78 .9	1°.6 above.
Upper Mississippi valley	76 .2	76 .2	Normal.
Lower Missouri valley	76 .8	76 .6	Normal.
Minnesota	69 .0	70 .0	1°.0 above.
Pacific Coast	66 .8	— .—	—— ——

No. II.



TEMPERATURES OF WATER FOR JULY, 1876.

STATIONS	Temperatures at bottom.		Average depth of water.
	Maximum.	Minimum.	Feet.
Alpena	76°	65°	14
Augusta	89	79	8
Baltimore	86	72	11
Buffalo	82	71	14
Burlington	80	68	19
Cairo	89	79	19
Charleston	87	82	44
Chicago	69	60	10
Cincinnati	81	67	15
Detroit	74	65	22
Duluth	65	39	13
Eastport	48	44	16
Escanaba	67	62	19
Grand Haven	83	67	19
Jacksonville	90	87	9
Keokuk	84	72	10
Knoxville	85	81	17
La Crosse	81	70	4
Louisville	85	78	7
Memphis	85	62	20
Marquette	60	49	17
Milwaukee	63	57	20
Mobile	87	83	16
Montgomery	90	84	9
Nashville	89	73	18
New London	73	65	12
New York	75	66	16
Norfolk	91	74	24
Omaha	79	70	30
Pittsburgh	84	75	6
Portland, Maine	63	57	26
St. Marks	84	76	14
St. Louis	86	72	23
St. Paul	82	69	3
Savannah	80	73	9
Toledo	85	74	13
Wilmington	87	75	10
Wood's Hole	76	72	8
Yankton	79	67	11

deflection of the isothermal lines 75°, 70°, and 65° to the south. It will be seen from the table that the greatest variations from the mean are, + 4°.5 in the Lower Lake region, and about + 3° in the Middle and Eastern States. Compared with July, 1875, the month has been decidedly warmer in the northeastern districts, and a lower mean prevailed in the Gulf States and Southwest. Compared with July, 1874, the temperature has been lower in the Mississippi, Missouri, and Lower Ohio Valleys. On the Pacific coast the temperature has averaged 69° at San Diego, 59° at San Francisco, and 67° at Portland, Oreg., or only a difference of 2° in temperature for 12° of latitude. Daily reports from the Signal-Service telegraph stations in Arizona gave temperatures ranging from 100° to 110° at the observation taken at 4.35 p. m., Washington time.

Maximum temperatures.—The highest temperatures for the month have occurred as follows: Baltimore, Cape Henry, New York, and Washington, 99°; Bismarck, Denison, Lynchburg, Philadelphia, Sandy Hook, and Tybee Island, 100°; Denver, Jacksonville, Montgomery, and Pittsburgh, 101°; North Platte and Norfolk, 103°; Corsicana, 105°; Dodge City, 108°.

Minimum temperatures.—Temperatures below 47° have been reported as follows: Pembina, 46°; Bismarck, Alpena, and Colorado Springs, 45°; Cheyenne and Marquette, 44°; Denver, 43°; Wytheville, 42°; Virginia City, 39°; Mount Washington, 32°; Pike's Peak, 18°.

Ranges of temperature.—The greatest ranges of temperature for the month are: Denver, 58°; Bismarck, Dodge City, and North Platte, 55°; Marquette, 54°; Alpena and Cheyenne, 52°; Wytheville, 51°; Colorado Springs and Virginia City, 50°. The smallest ranges have been: at New Orleans, 17°; San Diego, 18°; Key West, 19°; Galveston, 21°; Cape Lookout and Mobile, 22°; Cape May, Indianola, and San Francisco, 25°.

PRECIPITATION.

The quantity of rain-fall has generally been an excess, compared with that of previous years, although there is a deficiency reported in the Western Gulf States and Upper Missouri Valley. Chart No. III appears more irregular than usual, but the distribution of rain-fall does not materially differ from that of the previous month. The areas of over ten inches in the South Atlantic States diminished and moved southward, as is usual, with the advance of summer. A large excess occurred in the Lower Missouri Valley, the area extending northward over Iowa and the western portion of Illinois. An excess occurred a little south of the Lake region, which corresponds to a similar excess shown on the chart of the previous month. In comparing the rain-fall in the Lake region with that occurring in the districts east and west of it on the same latitude, it will be seen that the evaporation from these large bodies of water does not increase the precipitation in this region, although the number of days upon which rain falls is greater. Compared with July, 1875, the rain-fall has been more generally distributed; the large area of drought in the Gulf States during that year having received a rain-fall of from four to ten inches. A slight excess of rain occurred on the Pacific coast, but the average for the three stations amounts to only 0.33 inch, while no measurable quantity fell at San Diego.

Rainy days.—The number of days on which rain fell during the month varies from 11 to 17 in New England; 10 to 18 in the Middle States; 9 to 21 in the Southern States east of the Mississippi; 9 to 13 in the Southwest; 9 to 18 in the Lake region; 14 to 17 in the Ohio Valley; and 8 to 15 in the Northwest.

Fog.—Fog has been frequent only on the coast of New England and at San Francisco.

Heavy rains are reported as follows: Baltimore, 3.14 inches on the 30th; Charleston, 4.87, 16th, and 3.01, 24th; Dubuque, 4.55, 5th; Keokuk, 5.28, 4th and 5th; New Haven, 7.15, 30th and 31st; Newport, 3.45, 23d; Savannah, 3.56, 24th and 25th; Tybee Island, 4.50, 30th; Washington, 4.12, 30th; Southington, Conn., on the 30th and 31st, 4.10; Middletown, Conn., on 30th and 31st, 5.75; Riley, Ill., 10th, 3.50; near Independence, Iowa, heavy rain on 4th, damaging railroads, &c.; Ames, Iowa, 1.66 in one hour, 4th; Stanley, Kans., wind and rain storm 28th, damaging crops, fruits, &c.; Mendon, Mass., all the rain of month, 5.40, fell on 23d, 30th, and 31st; Worcester, Mass., from 3.46 p. m., 30th, to 7 a. m., 31st, 4.55; Waltham, Mass., 4.04 during 24 hours ending 3.40 p. m., 31st; Wet Glaze, Mo., 3.90, 12th, and 3.40, 15th; "cloud-bursts" in Nevada, at Gold Hill 22d and 24th, Genoa 20th, Eureka, 24th; Snowville, Va., 4.7 on 21st, causing damaging floods.

Snows.—Snow occurred at Pike's Peak on the 14th, 15th, and 18th; Mount Washington, 25th and 26th, Carson City, Nev., snowing on mountains on 7th.

Drought.—Rain needed at Mount Desert, Me., 21st; drought, May 10th to July 22d, Fall River, Mass.; fruit injured by drought, and springs low, Litchfield, Mich., 21st; month dry, vegetation scorched, Minneapolis, Minn.; rain needed for corn and cotton crops, Brookhaven, Miss., 31st; crops much damaged by droughts, Richmond, Nebr., 31st; drought until 20th, Auburn, N. H.; drought from June 20th to July 22d, Newark,

N. J.; drought to 29th, New Germantown, N. J.; very little rain from June 5th to July 23d, Brookhaven, N. Y.; drought very severe at North Hammond, N. Y., 17th; at Kensico, N. Y., crops suffering for rain first part of month; Stapleton, drought June 21st to July 11th; Flushing, N. Y., no rain until 10th; Farmingdale, N. Y., drought until 30th; Nottaway, Va., drought until 10th; Lynchburg, Va., drought very severe, from June 25th to July 28th; Newport, R. I., drought until 23d.

Hail.—2d, Mendon, Mass., Ringgold, Ohio; 3d, Afton, Iowa; 4th, De Soto, Nebr.; 6th, Rockford, Iowa; 7th, Mount Auburn, Ohio; 9th, Middletown and London, Conn.; 13th, Richmond, Nebr., Le Roy, Wis, Pike's Peak; 14th, Shelburne, N. H., Pike's Peak; 17th, near Nora Springs, Iowa, Genoa, Nebr.; 18th, 22d and 23d, Pike's Peak; 25th, Buffalo, Rochester, and Denver; 26th, Cornish, Me., Pike's Peak; 28th, Afton, Iowa; 29th Durham, Ark, Purdy, Tenn.

RELATIVE HUMIDITY.

The relative humidity, as reported from the Signal-Service stations, averages from 68 to 82 per cent at the stations on the New Jersey and New England coasts; from 61 to 71 at the stations in the interior of the Middle and Eastern States; from 65 to 77 in the Southern States and Ohio Valley; from 68 to 78 in the Lake region; and from 65 to 75 in the Upper Mississippi and Lower Missouri Valleys. It is, as usual, lowest on the western plains and the Rocky Mountains, being 54 at Bismarck, Dak., and North Platte, Nebr., 48 at Colorado Springs, 39 at Denver, 35 at Cheyenne, and 30 at Salt Lake City. The mean of Pike's Peak is 78, and that of Mount Washington, 90.

WINDS.

Prevailing winds.—The prevailing winds for the month are shown by the arrows on Chart No. II. They have been mostly from the south or southeast in the Gulf States and Lower Missouri Valley; from the south or southwest in the South Atlantic States, Tennessee, the Ohio Valley, and New England, but have been more variable in the Middle States, the Lake region, and the Upper Mississippi Valley.

Total movements of the winds.—At the Signal-Service stations, the largest monthly movements are as follows: Mount Washington, 23,762 miles; North Platte, 12,242; Cape Lookout, 12,020; Dodge City, 11,311; Fort Sully, 10,173; Breckenridge, 9,993; Pike's Peak, 9,456. The smallest total movements are: Wytheville, 2,025 miles; Lynchburg, 2,244; Augusta, 2,320; Nashville, 2,569; Burlington, Vt., 2,739; Shreveport, 2,837; Vicksburg, 2,851. These figures plainly indicate a region of very high winds in the western portions of Kansas, Nebraska, Minnesota, and Southwestern Dakota, and an extensive region of light winds in the interior of the Southern States.

Highest winds.—Among the highest wind-velocities reported from the signal stations are the following: Bismarck, 19th, NW., 56 miles per hour; Buffalo, 5th, SW., 60; Breckenridge, 44; Cape May, 4th, W., 48; Denison, 8th, 40; Dodge City, 3d, S. 46; Escanaba, 56; Fort Sully, 4th, 54; Indianola, 14th, 55; Mount Washington, 84; North Platte, 7th, 57; Pike's Peak, 8th, 50; Philadelphia, 20th, 40; Port Huron, 5th, 46; Saint Paul, 6th, 54; Sandy Hook, 11th, NW., 50; Toledo, 5th, 40.

High winds generally attending thunder-storms are also reported by voluntary observers as follows: Fort Madison, Iowa, damaging wind-storms, 3d; Ames, Iowa, severe wind-storm, 4th; Stanley, Kans., severe and destructive storms of wind and rain, 28th; Fallston, Md., severe wind-storm, 11th; Carthagena, Ohio, 20th; Newport, Vt., strong gales, 20th; Neillsville, Wis., severe wind-storm, 17th.

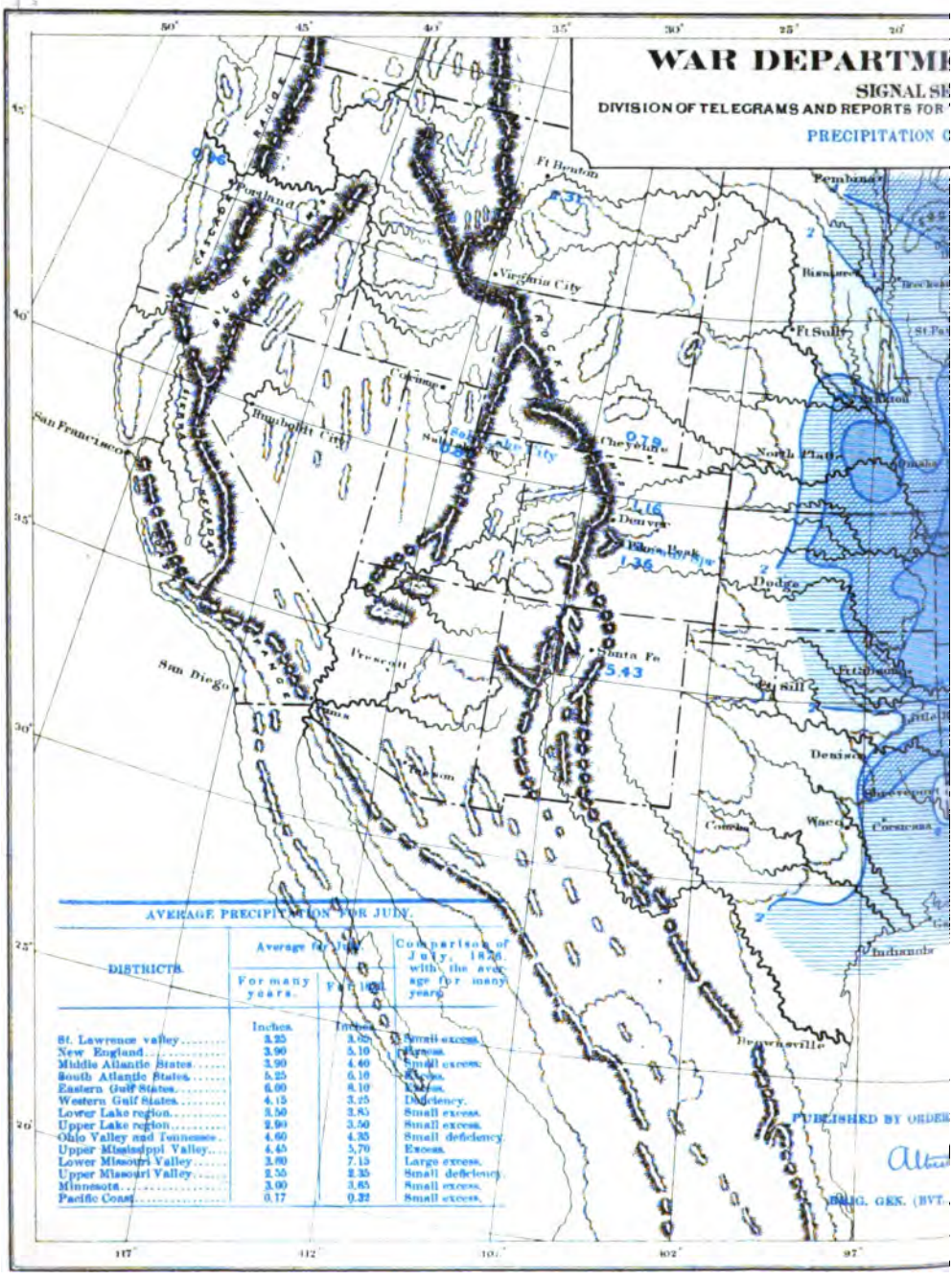
Tornadoes occurred at Spiceland, Ind., blowing down trees, &c., 4th; Nottaway and Norfolk, Va., 13th. A *whirlwind*, with a storm of grasshoppers, was observed on Pike's Peak on the 11th.

VERIFICATIONS.

Probabilities.—The usual comparison of the tri-daily probabilities, with the data contained in the three succeeding reports, gives 86.4 as the general average percentage of verifications. The percentage for each district is as follows: New England, 86.2; Middle States, 87.4; South Atlantic, 84.3; Eastern Gulf, 88.2; Western Gulf, 90.3; Lower Lakes, 87.8; Upper Lakes, 83.9; Tennessee and the Ohio Valley, 83.2; Upper Mississippi Valley, 88.7; Lower Missouri Valley, 85.5. The percentage of verification for each element is as follows; weather, 92.4; winds, 83; temperature, 86.1; barometer, 78.

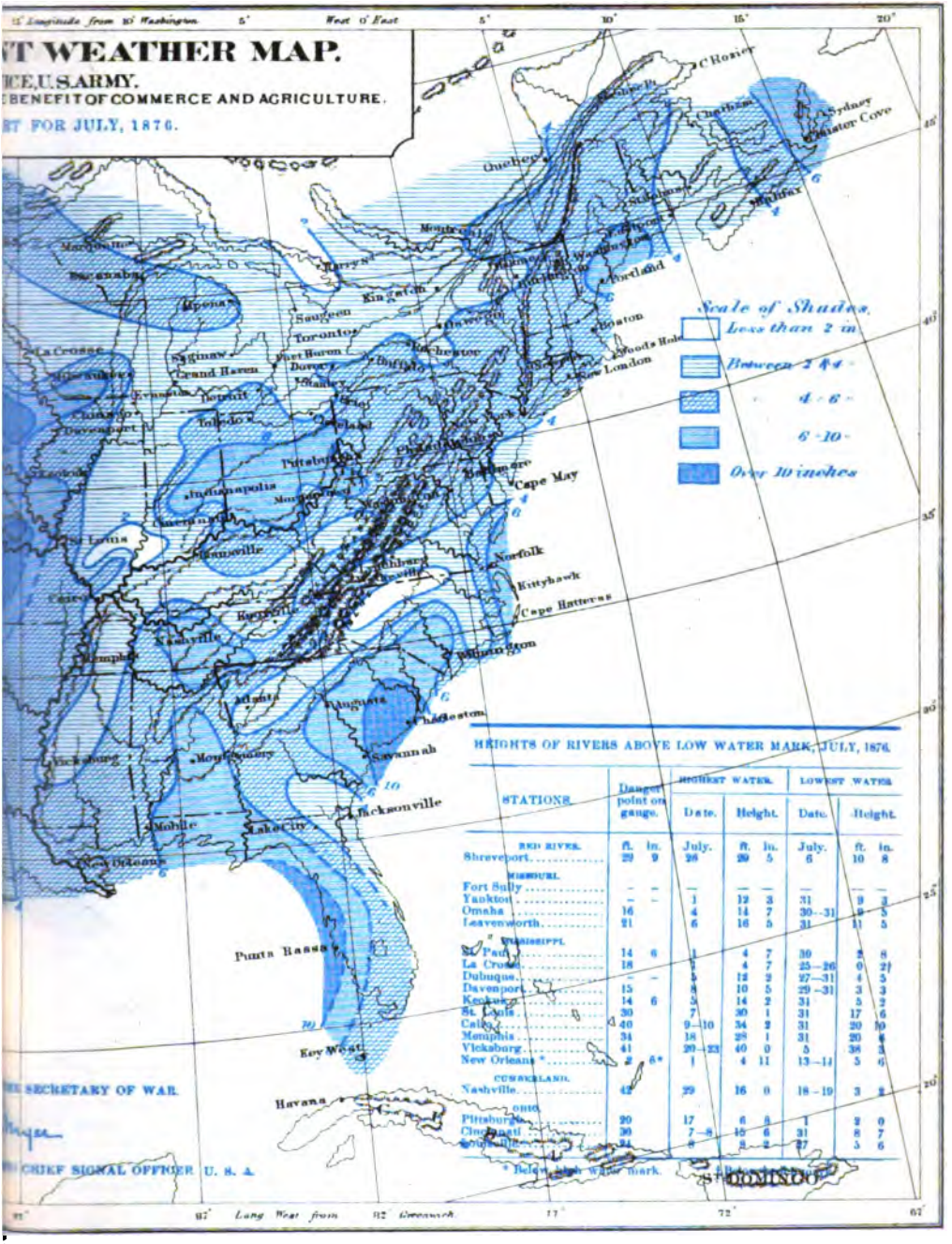
The observer at Nashville reports that the storm of the 21st caused dangerous floods in the small streams of the vicinity, and that warning was given by the "farmer's bulletin," which enabled the farmers to secure exposed grain and other property.

Cautionary signals.—Forty-three cautionary signals were displayed at the regular Signal-Service stations, of which twenty-three were justified by the occurrence of dangerous winds at or near the stations. Signals were ordered for the severe storm of the 4th and 5th, on the Middle Atlantic and New England coasts, but were not ordered for the stations on Lakes Erie, Michigan, and Huron.



AVERAGE PRECIPITATION FOR JUDY.

DISTRICTS.	Average for July. For many years.	Average for July. For 1876.	Comparison of July, 1876, with the average for many years.
	Inches.	Inches.	
St. Lawrence valley	3.25	3.05	Small excess.
New England	3.90	5.10	Excess.
Middle Atlantic States	3.90	4.40	Small excess.
South Atlantic States	5.25	6.10	Excess.
Eastern Gulf States	6.00	8.10	Excess.
Western Gulf States	4.15	3.25	Deficiency.
Lower Lake region	3.50	3.85	Small excess.
Upper Lake region	2.90	3.50	Small excess.
Ohio Valley and Tennessee	4.60	4.35	Small deficiency.
Upper Mississippi Valley	4.45	5.70	Excess.
Lower Missouri Valley	3.80	7.15	Large excess.
Upper Missouri Valley	2.55	2.35	Small deficiency.
Minnesota	3.00	3.65	Small excess.
Pacific Coast	0.17	0.22	Small excess.


T WEATHER MAP.
ICE, U.S. ARMY.
BENEFIT OF COMMERCE AND AGRICULTURE.
T FOR JULY, 1876.
Scale of Shades.
Less than 2 in.
Between 2 & 4 "
4 - 6 "
6 - 10 "
Over 10 inches
HEIGHTS OF RIVERS ABOVE LOW WATER MARK, JULY, 1876.
STATIONS.
Danger point on gauge.
HIGHEST WATER.
LOWEST WATER.
Date.
Height.
RED RIVER.
Shreveport
MISSOURI.
Fort Sully
Yankton
Omaha
Leavenworth
MISSISSIPPI.
St. Paul
La Crosse
Dubuque
Davenport
Keokuk
St. Louis
Cairo
Memphis
Vicksburg
New Orleans
CUMBERLAND.
Nashville
OHIO.
Pittsburg
Cincinnati
Louisville
SECRETARY OF WAR.
CHIEF SIGNAL OFFICER U. S. A.
Havana
Key West
Punta Rassa
Jacksonville
Savannah
Charleston
Wilmington
Norfolk
Cape May
Portland
Boston
Quebec
Halifax
Sydney
Pictou
Escanaba
Marquette
Grand Haven
Milwaukee
Chicago
Toronto
Detroit
Cleveland
Buffalo
Rochester
Oswego
Albany
Burlington
Montreal
Indianapolis
Cincinnati
Louisville
Nashville
Memphis
Vicksburg
Mobile
Lake City
New Orleans
Galveston
Eastport
Portland
Woods Hole
New London
Cape Hatteras
Kittyhawk
Cape Henry
Cape May
Lang. West from Greenwich
Long. West of Washington

NAVIGATION.

The stage of water.—The highest and lowest readings on the Signal Service river-gauges are given in the table on Chart No. III. In the Red River, at Shreveport, the highest reading, 29 feet 5 inches, is 4 inches below the "danger-line" of the Signal Service gauge, which occurred on the 28th. Dangerous floods occurred above this point, injuring the cotton-crop; and the observer at that station reports on the 22d that the heavy rise during the last day of the week came out of the lakes of that vicinity, while the river above was falling. The Mississippi was highest at Vicksburg on the 23d, when it was 40 feet, or 1 foot below the "danger-line." The Upper Mississippi declined during the entire month, and was lowest on the 31st. The Missouri was highest at Leavenworth on the 6th, and lowest on the 31st. Freshets occurred in the Upper Ohio, near Pittsburgh, in the Des Moines, near Keokuk, and the Yazoo, near Vicksburg. The observer at Portland, Oreg., reports that "the river, which at the commencement of the month was in the streets of Portland, has fallen quite rapidly, and is now about 15 feet below high-water mark."

WATER TEMPERATURES.

A table at the lower right-hand corner of the chart, No. II, gives the maximum and minimum temperatures of water as observed at the stations named; the third column gives the depth at which the observations were taken. The range of temperature was greatest at Duluth, 26°; Memphis, 23°; and least at Jacksonville, 3°; Mobile and Eastport, 4°. The average temperature of water on the Gulf and South Atlantic coasts was slightly above the mean temperature of the air, while on the Middle Atlantic and New England coast it was slightly below the temperature of the air.

ATMOSPHERIC ELECTRICITY.

Auroras have been observed on the following dates: that of the 16th being generally visible in the northern sections of the country, extending from Maine to Iowa; the reports are as follows: 8th, Litchfield, Mich.; 10th, Afton, Iowa; 12th and 15th, Duluth; 16th, Detroit, Oswego, Port Huron, Rochester, Mount Washington, La Crosse, Springfield, Marquette, Alpena, Grand Haven, Coresco, Iowa, Gardiner, Me., Auburn, N. H., Manitowoc, Wis.; 17th, Duluth, Gardiner, Me.; 18th, Malone, Saint Paul, Escanaba, Marquette, Alpena, Minneapolis, Minn.; 19th, Alpena, Gardiner, Me.; 20th, Saint Paul; 21st, Saint Paul; 23d, Fort Pembina; 25th, Malone, Gardiner, Me.; 29th, Boston, Rochester, Marquette, Dodge City, Breckenridge; 30th, Rochester; 31st Rochester, South Hartford, N. Y.

Thunder and lightning.—Local storms, accompanied by thunder or lightning, occurred in all the districts, and in a number of cases were destructive to property and life. Electrical displays were more numerous between latitudes 36° and 46°. Chronologically arranged, the reports are as follows: 1st, Florida, Illinois, Indiana, Kansas, Louisiana, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, West Virginia; 2d, Connecticut, Florida, Iowa, Louisiana, Massachusetts, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, Wyoming Territory, West Virginia; 3d, Connecticut, Dakota, Florida, Illinois, Indiana, Iowa, Kansas, Louisiana, Maine, Massachusetts, Mississippi, Missouri, Nebraska, New Hampshire, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee; 4th, Dakota, Delaware, Florida, Illinois, Indiana, Iowa, Kansas, Louisiana, Maine, Maryland, Massachusetts, Mississippi, Missouri, Nebraska, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Vermont, Virginia, West Virginia; 5th, Alabama, Connecticut, Delaware, Florida, Illinois, Iowa, Indiana, Kansas, Kentucky, Louisiana, Maine, Maryland, Mississippi, Michigan, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, Wisconsin, West Virginia; 6th, Connecticut, Delaware, Florida, Georgia, Indiana, Iowa, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Mississippi, North Carolina, Ohio, South Carolina, Tennessee, Virginia, Wisconsin; 7th, Florida, Louisiana, Michigan, Mississippi, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia; 8th, Dakota, Delaware, Florida, Indiana, Iowa, Kansas, Louisiana, Mississippi, Missouri, Nebraska, New Jersey, New York, Ohio, South Carolina, Tennessee, Vermont; 9th, Connecticut, Florida, Illinois, Indiana, Iowa, Kansas, Massachusetts, Michigan, New York, Ohio, Tennessee, Vermont, Wisconsin; 10th, Connecticut, Dakota, Delaware, Illinois, Indiana, Iowa, Louisiana, Maine, Maryland, Massachusetts, Michigan, Mississippi, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Tennessee, South Carolina, Vermont, Virginia, West Virginia; 11th, Connecticut, Delaware, Illinois, Indiana, Iowa, Louisiana, Maryland, Massachusetts, Mississippi, Nebraska, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, Ten-

nessee, Vermont, Virginia, West Virginia; 12th, Delaware, Florida, Illinois, Indiana, Indian Territory, Iowa, Kansas, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Nebraska, New Jersey, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, West Virginia; 13th, Colorado, Dakota, Florida, Illinois, Indiana, Iowa, Kansas, Louisiana, Maine, Maryland, Michigan, Mississippi, Missouri, Nebraska, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Vermont, Virginia, Wisconsin, West Virginia; 14th, Arkansas, Connecticut, Georgia, Iowa, Kansas, Louisiana, Maine, Massachusetts, Mississippi, Nebraska, New Hampshire, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Vermont, Virginia, West Virginia; 15th, Alabama, Arkansas, Colorado, Dakota, Illinois, Kansas, Louisiana, Mississippi, New Jersey, North Carolina, South Carolina, Tennessee, Virginia; 16th, Colorado, Dakota, Georgia, Louisiana, Minnesota, Mississippi, South Carolina, Tennessee; 17th, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Nebraska, Ohio, Tennessee, Virginia, Wisconsin; 18th, Connecticut, Dakota, Delaware, Georgia, Illinois, Iowa, Kansas, Maryland, Massachusetts, Mississippi, Nebraska, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Tennessee, Virginia; 19th, Dakota, Delaware, Iowa, Louisiana, Maryland, Michigan, Mississippi, Nebraska, New Hampshire, Pennsylvania, Tennessee, Virginia, Wisconsin; 20th, Connecticut, Delaware, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Mississippi, Missouri, Nebraska, Nevada, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Tennessee, Vermont, Virginia, West Virginia; 21st, Alabama, Arkansas, Dakota, Florida, Georgia, Iowa, Louisiana, Maine, Massachusetts, Mississippi, Nebraska, North Carolina, Pennsylvania, South Carolina, Tennessee, Utah, Virginia; 22d, Alabama, Arkansas, Dakota, Florida, Indiana, Kansas, Louisiana, Michigan, Mississippi, Nebraska, Nevada, New Jersey, New York, Ohio, Utah, Virginia; 23d, Connecticut, Delaware, Iowa, Kansas, Louisiana, Massachusetts, Nebraska, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Texas, Vermont, West Virginia; 24th, Colorado, Georgia, Indian Territory, Louisiana, Mississippi, Nevada, New York, North Carolina, Wyoming Territory, Texas, South Carolina; 25th, Colorado, Florida, Louisiana, Maine, Michigan, Mississippi, New York, Pennsylvania, Texas, Virginia; 26th, Dakota, Florida, Iowa, Kansas, Louisiana, Maine, Massachusetts, Mississippi, Nebraska, New Hampshire; 27th, Illinois, Indian Territory, Iowa, Kansas, Mississippi, Nebraska, Tennessee, Wisconsin; 28th, Dakota, Delaware, Illinois, Indiana, Iowa, Louisiana, Mississippi, Missouri, Nebraska, New York, Ohio, Tennessee, Virginia; 29th, Arkansas, Florida, Georgia, Kansas, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, Ohio, South Carolina, Tennessee, Virginia, Wisconsin; 30th, Dakota, Delaware, Florida, Georgia, Louisiana, Mississippi, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Utah, Virginia, West Virginia; 31st, Colorado, Dakota, Florida, Georgia, Ohio, South Carolina, Wyoming Territory.

OPTICAL PHENOMENA.

Mirage.—This phenomenon was observed on the 1st, 5th, 7th, 8th, 13th, and 21st, at New London, Conn.; 15th, 24th, and 28th, at Breckenridge, Minn.; 22d and 26th, at Tybee Island, Ga.

Solar halos were observed on the 1st, at Cornish, Me., Contoocookville, N. H., Rochester, Eastport, Escanaba, Tybee Island; 2d, Contoocookville, N. H., Tybee Island; 3d, Rocky Run, Manitowoc, Wis., Escanaba, Dodge City; 4th, Hennepin, Ill., Purdy, Tenn., Cape Lookout; 5th, Leesburg, Ind., Cornish, Me., Howard, Nebr., Ringgold, Ohio, Purdy, Tenn.; 6th, Ringgold, Ohio; 7th, Gardiner, Me., Ringgold, Ohio, Purdy, Tenn., Rochester, New London; 8th, Contoocookville, N. H., Purdy, Tenn.; 9th, Howard, Nebr.; 10th, Leroy, Kans., Ringgold, Ohio; 11th, Leesburg, Ind.; 14th, Hennepin, Ill., Fayette, Miss., Howard, Nebr., Keokuk; 16th, Corsicana, Smithville; 17th, Rockford, Ill., Carthagena, Ohio; 18th, Bethel, Ohio, Leroy, Wis.; 19th, Smithville; 20th, Standish, Me.; 21st, Leroy, Wis., Tybee Island, Charleston, Fort Gibson; 22d, Rochester, North Platte; 23d, Cairo, Saint Louis; 24th, Fayette, Miss., Tybee Island; 25th, Malone, N. Y.; 26th, Ringgold, Ohio, Rochester, Wytheville, Grand Haven, Key West; 27th, Cornish, Me., Waltham, Mass., Contoocookville, Auburn, N. H., Brook Haven, N. Y., Westminster, Vt., Toledo, New London, Fort Gibson; 28th, Independence, Iowa, Eastport, Cape Lookout; 29th, Atlantic City, Tybee Island, Jacksonville, Charleston; 30th, Gardiner, Me., Contoocookville, Auburn, N. H., Ringgold, Ohio, Rochester, Tybee Island, Jacksonville; 31st, Purdy, Tenn., Fort Gibson.

Lunar halos were observed on the 1st, at Nottoway, Va., Rochester, Eastport, Knoxville, Wilmington, Pittsburgh; 2d, Knoxville; 3d, Purdy, Tenn., Leroy, Wis., Knoxville, Dodge City, Buffalo, Smithville; 4th, Ruggles, Ohio, Manitowoc, Wis., Cape Henry, Duluth; 5th, Ringgold, Ohio, Bismarck, Cairo, Duluth, Evanston, Smithville; 6th, Purdy, Tenn., Bismarck, Eastport, Morgantown, Alpena, Evanston, Smithville; 7th, Standish, Me., Purdy, Tenn., Rochester, Newport, Wytheville, Morgantown, Evanston, Pittsburgh; 8th, Bismarck, Rochester, New Orleans, Smithville; 9th, Newport,

Smithville; 10th, Atlantic City, Newport, Smithville; 12th, Newport; 25th, Evanston; 26th, Dodge City; 27th, Eastport, Smithville; 28th, Newport, Mobile, Smithville; 29th, Fayette, Miss., Waterburg, N. Y., New Orleans, Buffalo, Evanston; 30th, Fayette, Miss., Wytheville, Evanston, Pittsburgh; 31st, Evanston.

MISCELLANEOUS PHENOMENA.

Zoological.—Martins left Bellefontaine, Ohio, 26th. *Grasshoppers* at Richmond, Nebr., flying north on the 2d and 3d, and flying with the wind 26th, 27th, 29th, 30th, and 31st. A storm of grasshoppers at Pike's Peak, 11th; swarms of grasshoppers at Yankton, 27th, 28th, 29th, 30th, and 31st; numerous at Breckenridge, 10th, 11th, and 12th; left, going southeast, 13th; appeared again 19th and 23d. First appeared at Pembina, flying northeast, 8th and 9th, southeast 11th, 12th, 17th, 20th, and south 13th; at Virginia City were flying southwest 11th to 20th, and southeast 27th to 31st; much damage done in some localities; at Fort Sully, flying northwest, and alighting, 15th; northwest, 26th; numerous, 16th, 27th, 28th, 29th, 30th. *Colorado beetles* numerous on potato vines at Malone, N. Y., 20th; the first potato bug of the "Blue Species" on the 17th, at Stanley, Kans.; at Auburn, N. H., on potato and tomato vines, latter part of month.

Prairie fires.—2d, Breckenridge; 3d, Bismarck; 26th, southeast and southwest of Oregon, Mo.

Forest fires.—15th, 16th, 17th, 22d, Eastport. Freehold, N. J., on the 4th, a large fire was started, and continued for some days, destroying crops, timber, &c.

Polar bands were observed on the 8th at Cape Henry, Va.; 11th, 17th, 24th, and 27th, Bennettsville, Ky.; 15th, Iowa City; 24th, Carthegena, Ohio.

Meteors.—Those of the 8th and 9th were unusually brilliant, and attracted general attention; that of the 8th passed in a northwesterly direction, the projection of its path being the track of a vertical plane passing through Saint Paul and Louisville, and as it passed over a right line joining Cairo and Detroit, it had an altitude of about one hundred and sixty miles. The observer at Cairo reports, "The track of this meteor could be traced by a bright line of fire, which was visible for more than an hour after the meteor disappeared." The observer at Detroit reports, "The meteor first appeared as a star of small magnitude, but became elongated and more brilliant as it pursued its course; it broke, giving off an intense blue light, which was succeeded by a less brilliant greenish light, and this, in turn, succeeded by a white light; the track of the meteor was visible for more than half an hour after the explosion." The observer at Port Huron reports, "This meteor appeared to be about one-fourth the size of the full moon, and illuminated the entire heavens for fully half an hour." The meteor of the 9th, observed generally in the Middle Atlantic and New England States, had the same general course, to the northwest, but its altitude cannot be determined from the reports received.

Meteors, chronologically arranged, were observed as follows: 4th, Tybee Island; 7th, Dubuque; 8th, Port Huron, Cairo, Sandy Hook, Logansport, Grand Haven, Evanston, Indianapolis, Hennepin, Riley, Lyndon, Carbondale, and Friendsville, Ill.; Bloomington, Spiceland, and Rising Sun, Ind.; Muscatine, Iowa; Bennettsville, Ky.; Detroit, Grand Rapids, Litchfield, Traverse City, and Hudson, Mich.; Waterburg, N. Y.; Bellefontaine, Urbana, Kenton, Jacksonburg, and Ruggold, Ohio; York, Sulphur Springs, Pa.; Rockwood, Tenn.; Bloomfield, Rocky Run, Manitowoc and Utica, Wis.; 9th, Morgantown, New London, Sandwich, and Carbondale, Ill.; Vevay and Wabash, Ind.; Fallston, Md.; Somerset and Fall River, Mass.; Trenton, South Orange, and New Germantown, N. J.; Ardenia, Waterburg, Wappinger's Falls, and New York, N. Y.; Carthagena, Ohio; Hanover, Pa.; Spartanburg, S. C.; Rockwood, Tenn.; 10th, Dubuque and Afton, Iowa; Corning, Mo.; 11th, Lyndon, Ill.; Corning, Mo.; 12th, Smithville, Newport, and Mayport, Fla.; Corning, Mo.; 13th, Evanston; 15th, Newport, Dodge City, Jacksonville; 16th, Jacksonville; Evanston; Cresco, Iowa; 17th, Davenport; Lyndon, Ill.; 18th, Smithville; 19th, Davenport; Lyndon, Ill.; 20th, Evanston, Lyndon, Ill.; Smithville, McMinnville, Tenn.; 21st, Newport; Jacksonville; Utica, Wis.; 22d, Ephrata, Pa.; 24th, Evanston; Vevay, Ind; 25th, Davenport; Auburn, N. H.; 26th, Smithville, Davenport; 28th, Dodge City, Jacksonville, Smithville; Ellinwood, Kans.; 29th, Point Pleasant, La.; 30th, Carbondale, Ill., Wooster, Ohio.

Published by order of the Secretary of War.

ALBERT J. MYER,
Brig. Gen. (Brevet Assigned), Chief Signal-Officer, U. S. A.

PAPER 27.

MONTHLY WEATHER REVIEW, AUGUST, 1876.

INTRODUCTION.

In compiling the present review, the usual data have been made use of. The most noticeable features of the month are: the movements of the low-pressure areas; the high mean temperatures in the northern, central, and eastern districts; the small total rain-falls in the northeastern districts, with resulting droughts and numerous, extensive and destructive forest-fires; the grasshoppers in the Northwestern States and Territories.

BAROMETRIC PRESSURE.

In general.—The general distribution of the atmospheric pressure for the month is represented upon Chart No. II by the isobaric curves. For Mount Washington the mean is 30.31 inches, and for Pike's Peak 30.23 inches. Excepting these, the highest means have been reported from Portland, Or., and the stations along the Atlantic coast, from Florida to Southern New England; the lowest, from Fort Gibson, 29.77, Bismarck, 29.70, Dodge City, 29.52, and North Platte, 29.47 inches. The ranges in the barometers are, for Key West, .24 of an inch; San Francisco, .33; Gulf States, .30 to .43; Tennessee and the Ohio Valley, .29 to .42; South Atlantic States, .41 to .47; Middle Atlantic States, .42 to .50; Upper Mississippi Valley, .42 to .69; Lower Lake region, .53 to .57; Upper Lake region, .53 to .66; New England, .53 to .72; Rocky Mountain stations, .40 to .64; Lower Missouri Valley, .62 to .93, and western portions of Kansas, Nebraska, and Dakota, .96 to 1.24 at Bismarck.

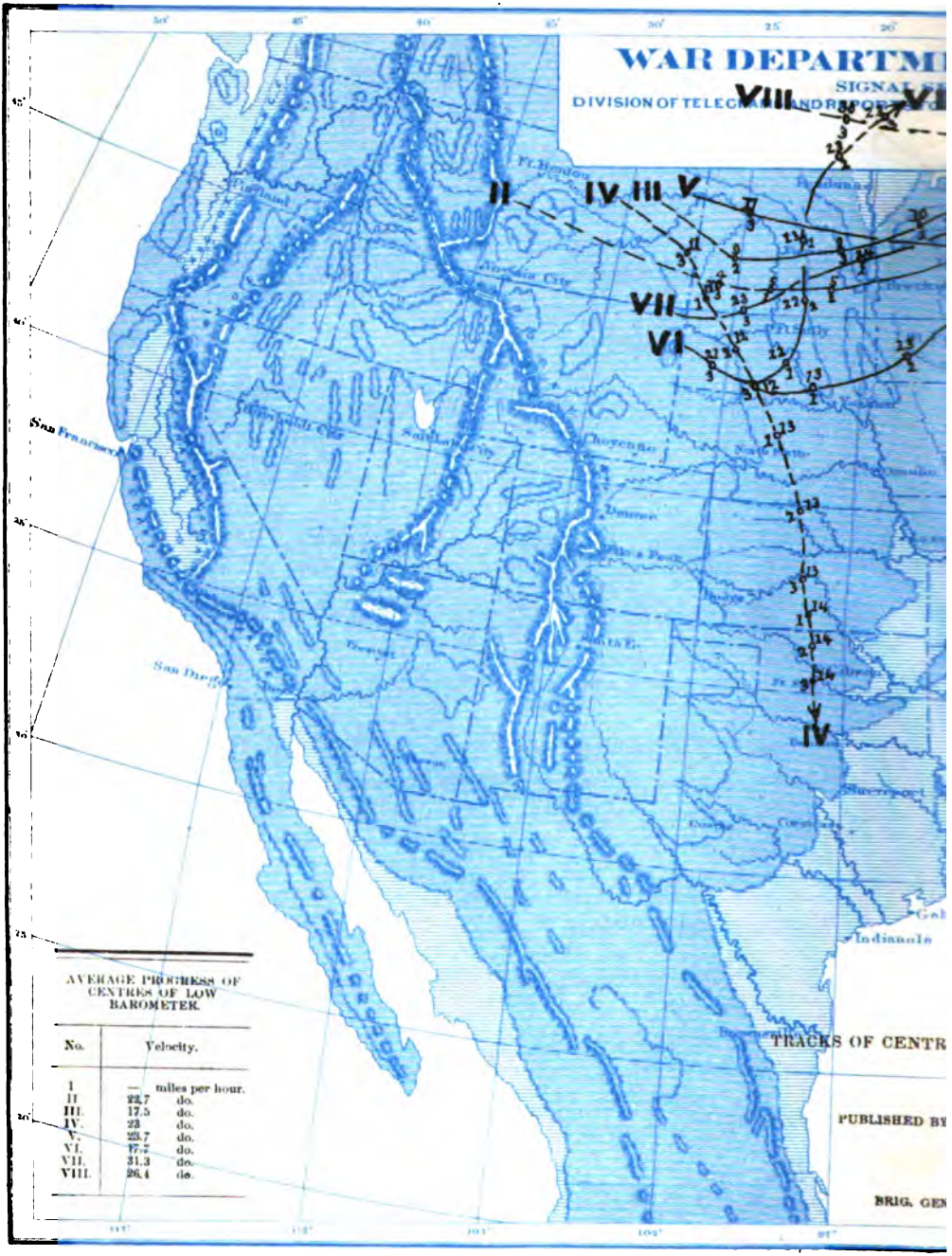
Areas of high pressure.—Seven have crossed the northern sections of the country during the month. As the intervals between their passage were comparatively short, the periods of warm weather, caused by the movement of the low-pressure areas, were generally of short duration, excepting for the Gulf States.

No. I.—At 7.35 a. m. of the 1st, this high-pressure area extended from the Lakes to the Saint Lawrence Valley, with a barometric ridge running to the Western Gulf States, and was accompanied by cool, clear weather. By morning of the 2d, the pressure had considerably increased in the northern sections, and isobar 30.30 inches included New England and New Brunswick. During the 2d, 3d, and 4th it increased in the South Atlantic States, and succeeding low pressures, No. I, diminished in the northern sections, especially in the Northwest and Lake region, in advance of low pressure No. II, and continued highest over New England. In connection with low-pressure No. I, brisk and occasionally high north to east winds and heavy seas were produced along the coast from New Jersey to North Carolina on the 1st and 2d. In latitude 37° 78′ north, longitude 73° 10′ west, a southwest gale was experienced on the 2d and a northeast gale on the 3d. On the morning of the 5th the highest pressure, above 30.10, covered the Atlantic States, continued increasing in the Southern States during the 5th and 6th, and was central in Georgia at 7.35 a. m. of the 7th, after which it lost its distinctive features. Cautionary signals were ordered on the 1st and 2d along the South and Middle Atlantic coasts, which were justified, except at Tybee Island, Ga., Kittyhawk, Cape Henry, and Norfolk.

No. II.—Following low-pressure No. II, it passed over the Missouri and Upper Mississippi Valleys during the 5th and 6th, but was of little interest. It moved to the Upper Lake region on the 7th. On the morning of the 8th, with No. I., an extensive area, included by isobar 30.10, reached from the Lakes to the Southern States east of the Mississippi. At 7.35 a. m. of the 10th it covered the Atlantic States, where it continued, with increased pressure, on the 11th and 12th, and then gradually disappeared off the New England coast on the 13th and 14th.

No. III.—On the 7th and 8th it was felt at Portland, Or., reaching its maximum on the morning of the 9th. During the 9th it appeared in Montana and Dakota, in rear of low-pressure No. III, and gradually extended southward, producing high northerly winds or gales and a decided fall in the temperature in Wyoming and Western Nebraska, which conditions reached Kansas and the Missouri Valley, with decreasing wind-velocities on the 10th. The temperature fell from 85° to 33° at Virginia City, Mon., within sixteen hours, during the night of the 8th, and destructive frosts occurred in Northeastern Utah on the morning of the 10th. At 7.35 a. m. of the 11th it extended from Southern Minnesota southwestward beyond Kansas, and then rapidly lost its identity under the influence of low-pressure No. IV.

No. IV.—During the 12th, while low-pressure No. IV was approaching the Northwest, this area made its appearance at Fort Garry, Manitoba, and undoubtedly forced the former to take the southeastward course shown upon Chart No. I. Brisk northerly winds and falling temperature prevailed from Dakota and Western Minnesota to Utah and Nebraska on the 13th. These conditions reached Kansas, the Upper Mississippi



AVERAGE PROGRESS OF CENTRES OF LOW BAROMETER.

No.	Velocity.
I	— miles per hour.
II	22.7 do.
III.	17.5 do.
IV.	23 do.
V.	23.7 do.
VI.	17.7 do.
VII.	31.3 do.
VIII.	26.4 do.

No. I.



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Valley, and the Upper Lake region during the 14th. By morning of the 15th the central highest moved from Dakota to the north of Lake Superior. On the morning of the 16th it covered the Lake region and Saint Lawrence Valley, but with decreased pressure, and then rapidly disappeared.

No. V.—Was first observed at Fort Garry on the morning of the 19th. During the day it extended southeastward over Minnesota toward the Upper Lakes, with cool, fresh, and brisk northerly winds. At 7.35 a. m. of the 20th the highest, above 30.26 inches, was central over or north of Lake Superior, with occasional light frosts in Wisconsin and New York. On the following morning isobar 30.20 inches included Lower Michigan, Lake Huron, Lower Lakes, and the Middle States, with very cool, clear weather. Light frosts were reported from a few stations in Wisconsin, Michigan, Pennsylvania, New York, Vermont, and New Hampshire; from Malone, N. Y., and near Port Huron, Mich., heavy and destructive frosts. On the summit of Mount Washington frost-work formed early in the morning. During the 21st and 22d the pressure diminished, and on the morning of the 23d two areas of 30.10 inches covered the South Atlantic States and Saint Lawrence valley. The latter disappeared during the 23d and 24th in advance of low-pressure No. VII; the former extended over the Gulf States, losing its distinctive features on the 25th. Light frosts occasionally occurred in Pennsylvania, New York, Massachusetts, New Hampshire, and Maine on the morning of the 22d.

No. VI.—At Portland, Oreg., the barometer rose to 30.39 inches at the 4.35 p. m. observation of the 23d, and a rapid rise occurred at Virginia City during the day and night. During the 24th it reached the Missouri Valley, with cool, clear weather and brisk to high northerly and westerly winds, diminishing in force at night. At Dodge City, north, 35 and Santa Fé, east, 34 miles were recorded. On the morning of the 25th the highest, above 30.40 inches, was central over Nebraska, and during the day the area extended over the Lake region, Ohio Valley, and interior of the Western Gulf States, with cool, clear weather. At 4.35 p. m. of the 26th, the barometric ridge covered the Mississippi Valley. Its influence was felt in the Middle and New England States on the 26th and 27th, and in the South Atlantic States the 28th, after which it disappeared in advance of low-pressure No. VIII. During its progress eastward light frosts were occasionally produced near Portland, Oreg., on the morning of the 24th; in Iowa and Wisconsin on the 25th; in Eastern Dakota, Minnesota, Iowa, Wisconsin, and Michigan on the 26th, injuring vegetation at Pembina; in Wisconsin, Illinois, Indiana, and Michigan on the 27th, and in Pennsylvania on the 28th.

No. VII.—This was observed at Portland, Oreg., on the 28th and 29th, near which light frosts occurred. Succeeding low-pressure No. VIII, it appeared in Dakota, Wyoming, and Nebraska on the morning of the 31st, with brisk and high northerly winds and cool, clear, or partly cloudy weather. At Fort Sully an hourly wind-velocity of 48 miles was recorded. During the day it reached Kansas, the Upper Mississippi Valley, and Upper Lake region. At Coalville, Utah, frost and first skim of ice were formed. Its subsequent history belongs to September, but its movement was southeastward across the country over the South and Middle Atlantic coasts, and had the effect of producing considerably cooler weather during its passage.

Areas of low pressure.—By referring to chart No. I it will be seen that the centers of the barometric depressions, after appearing in the Upper Missouri Valley, have generally taken a northeastward course into Canada, and farther to the northward than during previous Augusts. The result has been a diminution in the rain-fall in the northern, central, and eastern districts. Frequently, while the main disturbances have continued almost stationary in the extreme Northwest, as well as during their progress northeastward, minor depressions have been developed and sent out to the eastward or southeastward, which have produced severe thunder-storms, while others have moved southward toward Texas, similar to the branch of No. IV, and gradually disappeared.

No. I.—Under the influence of high-pressure No. I, this disturbance, described in the July review as No. VIII, disappeared southeastward on the 1st, producing frequent thunder-storms along the South Atlantic coast and in Florida, with a high southwest wind at Punta Rassa.

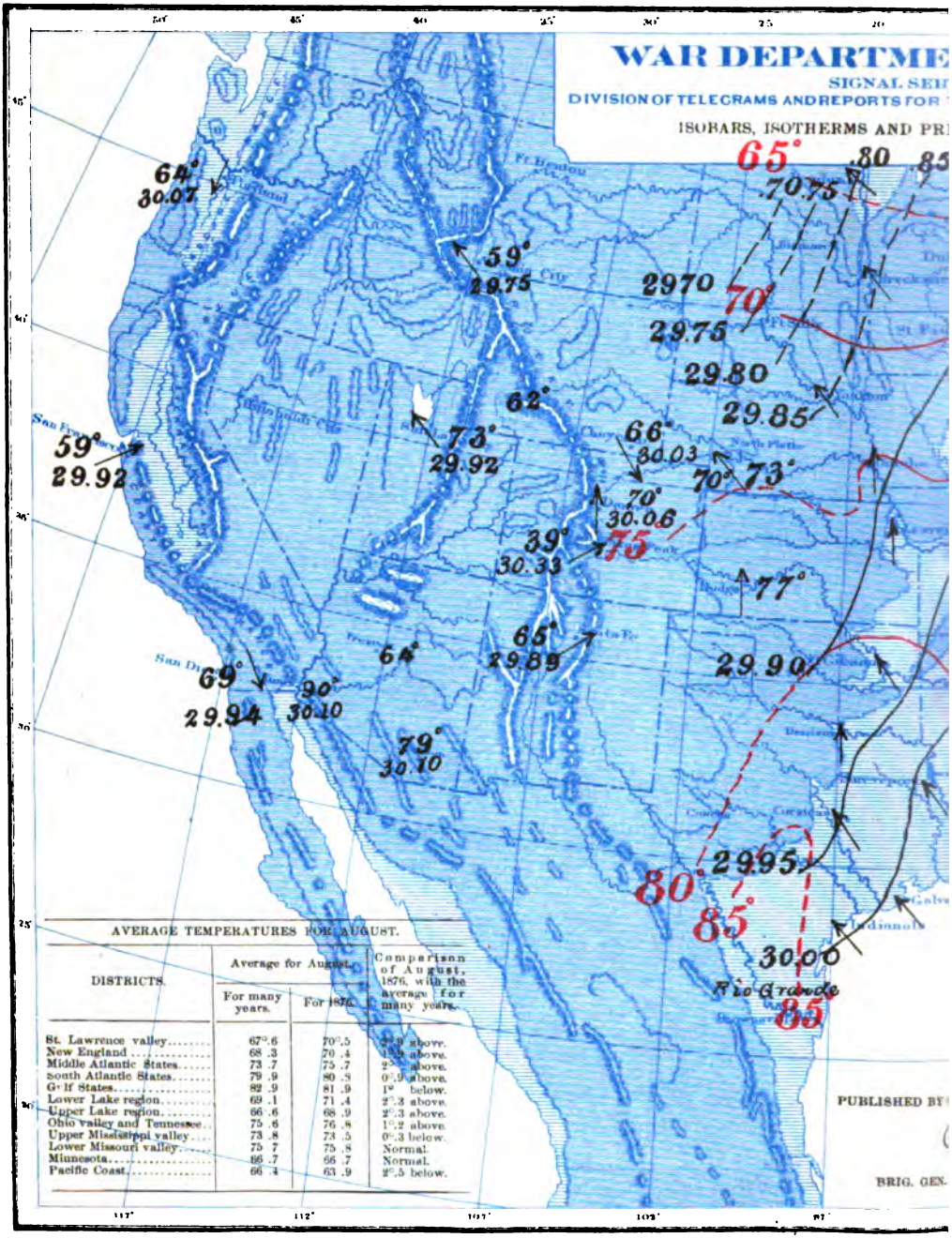
No. II.—On the 2d, falling barometer and rising temperature at Virginia City and the stations in the Upper Missouri Valley indicated the approach of this storm, and thunder-storms occurred in Dakota. At Bismarck a northeast wind-velocity of sixty-one miles per hour was recorded. During the 3d occasional thunder-storms were reported from Dakota, Minnesota, and Wisconsin, and snow fell on Pike's Peak. On the 4th the central depression advanced southeastward into Dakota, with thunder-storms in Missouri, Kansas, Iowa, Wisconsin, Michigan, Indiana, Ohio, and Tennessee, which were violent in first and last. At Burlington, Iowa, a high wind prevailed; at North Platte southeast 32, at Saint Louis 32, and at Bismarck 62 miles were recorded. During the 5th it reached Northern Minnesota, with thunder-storms in Dakota, Iowa, Nebraska, Kansas, Missouri, Illinois, Indiana, Michigan, Ohio, Western Pennsylvania, West Virginia, Kentucky, and Tennessee. They were reported

as destructive at Girard, Pa., and Cleveland. On the 6th it passed northeastward into Canada, with occasional thunder-storms from Tennessee and North Carolina to Iowa and the Lakes, in Northern New England, and in the Central Gulf States. Heavy rains fell in the Upper Mississippi Valley, and hail at Vevay, Ind. At Marquette a south wind reached 30 miles. During the 7th the center of this disturbance probably moved eastward along the parallel of 50° north, with continued thunder-storms from Virginia and Illinois northeastward to Nova Scotia and New Brunswick. A tornado occurred at Berlin, Pa., a violent and destructive hail-storm at Honesdale, Pa., and a destructive thunder-storm at Springfield, Mass. On the 8th it moved eastward beyond the Gulf of Saint Lawrence, and on Mount Washington the hourly wind-velocity reached 60 miles from the northwest. Cautionary signals were ordered on the 4th at Duluth, and on the 5th at Milwaukee, Escanaba, and Marquette. The two first were not justified.

No. III.—The approach of this storm was indicated by high winds, falling barometer and high temperatures, on the 6th and 7th, from Montana to Dakota and Nebraska. At Virginia City the temperature reached 92° (highest ever recorded), and 107° at Fort Sully. During the 8th the temperature reached 99° at Breckenridge, 97° at North Platte, and 103° at Bismarck, with a southeast wind of 67 miles at last, south 30 at Marquette, and thunder-storms, occasionally accompanied by hail, in Dakota. On the 9th the central depression passed into Northeastern Dakota, with severe thunder-storms from Dakota and Minnesota toward Ohio, Indiana, Illinois, and Kansas. Heavy hail-storms prevailed on Pike's Peak and at Atlanta, Ga. At Bismarck, southeast 43 and northwest 53, North Platte, southeast 44, and Breckenridge, southeast 48 miles were recorded. As will be observed on Chart No. I, it rapidly passed northeastward into Canada on the 10th, with a barometric trough extending southward to Texas. Thunder-storms accompanied it from Minnesota and the Upper Lakes southward to the Gulf States. The following are the highest hourly wind-velocities: Escanaba, south 25, Milwaukee, southeast 26, Dodge City, northwest 36, and North Platte, northwest 60. Occasional thunder-storms continued on the 11th from Michigan to Kentucky, West Virginia, and Western Pennsylvania, and on the 12th in the Middle States, with a severe local storm at Savannah, during which the wind reached 40 miles from the northeast. Cautionary signals were ordered for Toledo and the stations along the Upper Lakes, but those for Lake Michigan alone were reported justified.

No. IV.—Following high pressure No. III, it was felt in Montana on the 10th and in Dakota on the 11th, with a high southeast wind at Breckenridge, and temperature of 96° at Fort Sully. By midnight of the 12th it had reached the southern boundary of Dakota. High southerly winds occurred in the western portions of Kansas and Nebraska, and occasional thunder-storms in Colorado and Dakota. During the 13th it developed into two distinct depressions, one moving toward Lake Superior and the other southward toward Texas. Thunder-storms accompanied them from Minnesota and Wisconsin to Nebraska, Kansas, Texas, Missouri, and Illinois, with occasional high winds and gales. A secondary depression developed to the eastward, from which a gale resulted at Bellefontaine, Ohio, and a destructive water-spout in the vicinity of Lynchburg. A rain-fall of 5.25 inches was recorded at Boonsborough, Va. Thunder-storms continued on the 14th in Nebraska, Kansas, and Missouri, and occasionally in South Carolina, Florida, and Ohio. At Escanaba, after the wind shifted to north, with clearing weather, it reached 24 miles. During the 15th the central depression reached the mouth of the Saint Lawrence, and thence apparently moved southeastward toward Nova Scotia, with thunder-storms from New York and New England northeastward. A tornado was reported to have occurred near Milton, Ohio, and a destructive wind and hail storm between Wappinger's Falls and Poughkeepsie, N. Y. On the 16th it disappeared southeastward over and beyond Nova Scotia. Not any cautionary signals were ordered to be displayed during its progress eastward, and the only station at which they would have been justified is Escanaba.

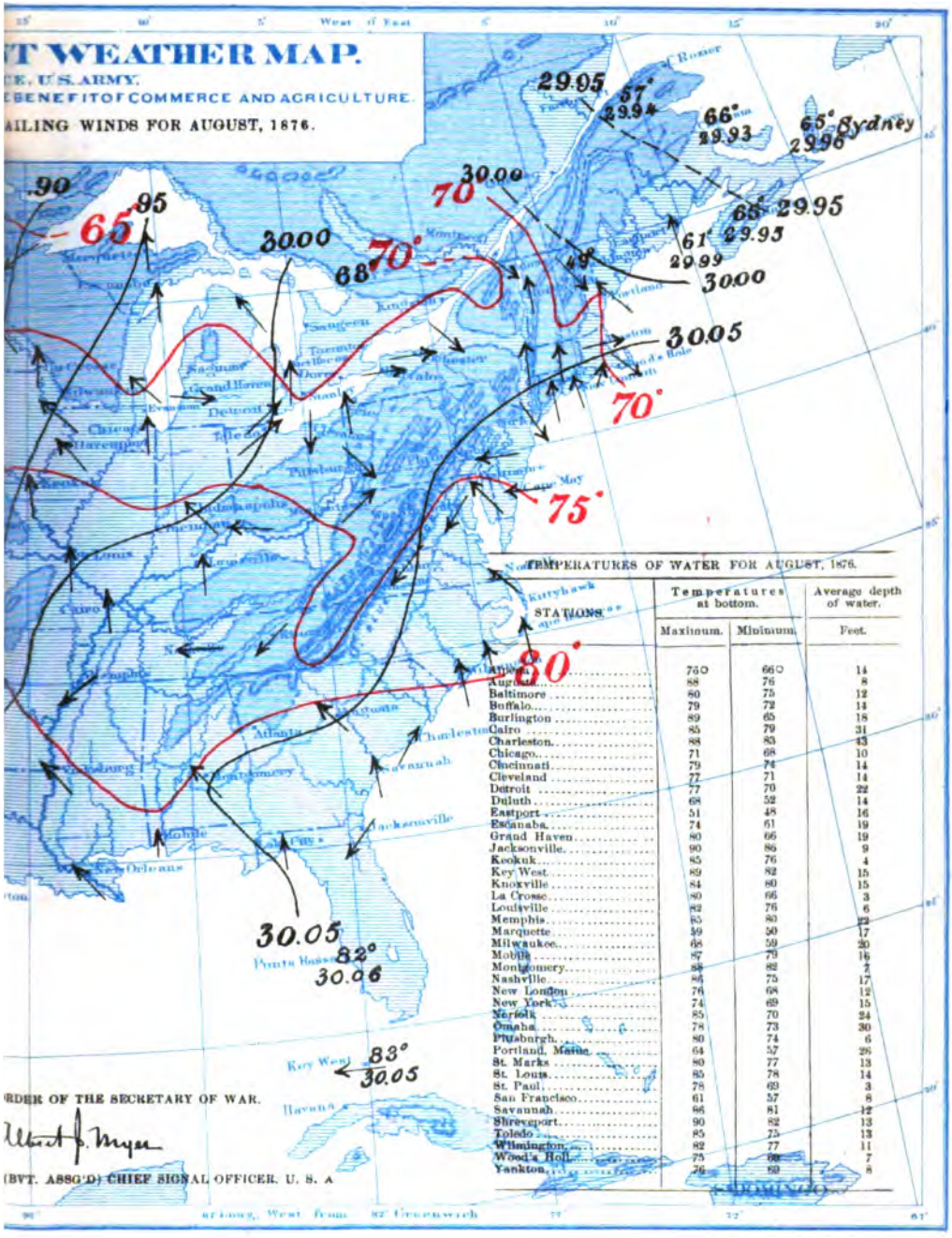
No. V.—During the 16th, the pressure was considerably below the mean in Nebraska and Kansas, with a barometric trough extending toward Ohio, over which area occasional thunder-storms occurred. Hail fell at North Platte. Near Manhattan, Kans., the heavy rains caused floods. A gale was reported from Rockford, Ill., southeast 50 miles from North Platte, and south 30 from Dodge City. At midnight of the 17th, the central depression was located in Northern Dakota. Thunder-storms, with heavy rains at places, occurred from Dakota and Minnesota to Kansas, Kentucky, Ohio, and from South Carolina to New Jersey, Pennsylvania, and Virginia, and a tornado near Cape May. During the 18th it rapidly moved eastward to Lake Huron, with continued thunder-storms from the Lower Missouri Valley to the Upper Lakes and Ohio, and in the Carolinas. High westerly winds prevailed near Cape Hatteras. On the 19th, it advanced to the Saint Lawrence Valley, accompanied by heavy winds at Fort Niagara, N. Y., and north 32 miles at Escanaba. On Lake Erie, near Madison, Ohio, several water-spouts were formed, which traveled eastward. Off Cape Hatteras, latitude 30° 40′, longitude 75° 23′, during a severe thunder-storm, a northwest squall occurred with the force of a gale. During the 20th, a secondary depression was developed, as



AVERAGE TEMPERATURES FOR AUGUST.

DISTRICTS.	Average for August.		Comparison of August, 1876, with the average for many years.
	For many years.	For 1876.	
St. Lawrence valley	67°.6	70°.5	2°.9 above.
New England	68 .3	70 .4	1°.9 above.
Middle Atlantic States	73 .7	75 .7	2° above.
South Atlantic States	79 .9	80 .8	0°.9 above.
Gulf States	82 .9	81 .9	1° below.
Lower Lake region	69 .1	71 .4	2°.3 above.
Upper Lake region	66 .6	68 .9	2°.3 above.
Ohio valley and Tennessee	75 .6	76 .8	1°.2 above.
Upper Mississippi valley	73 .8	73 .5	0°.3 below.
Lower Missouri valley	75 .7	75 .8	Normal.
Minnesota	66 .7	66 .7	Normal.
Pacific Coast	66 .4	63 .9	2°.5 below.

No. 11.



TEMPERATURES OF WATER FOR AUGUST, 1876.

STATIONS	Temperatures at bottom.		Average depth of water.
	Maximum.	Minimum.	Feet.
Anglen	76O	66O	14
Augusta	88	76	8
Baltimore	80	75	12
Buffalo	79	72	14
Burlington	89	65	18
Cairo	85	79	31
Charleston	88	83	13
Chicago	71	68	10
Cincinnati	79	74	14
Cleveland	77	71	14
Detroit	77	70	22
Duluth	68	52	14
Eastport	51	48	16
Escanaba	74	61	19
Grand Haven	80	66	19
Jacksonville	90	86	9
Keokuk	85	76	4
Key West	89	82	15
Knoxville	84	80	15
La Crosse	80	66	3
Louisville	82	76	6
Memphis	85	80	22
Marquette	59	50	17
Milwaukee	68	59	20
Mobile	87	79	16
Montgomery	88	82	7
Nashville	86	75	17
New London	76	68	12
New York	74	69	15
Norfolk	85	70	24
Omaha	78	73	30
Pittsburgh	80	74	6
Portland, Maine	64	57	28
St. Marks	80	77	13
St. Louis	85	78	14
St. Paul	78	60	3
San Francisco	61	57	8
Savannah	86	81	12
Shreveport	90	82	13
Toledo	85	75	13
Wilmington	82	77	11
Wood's Holl	75	69	7
Yankton	76	59	8

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shown on the chart. Thunder-storms occurred from Eastern New York to Nova Scotia and New Brunswick. In latitude 33° north, longitude 75° west, a cyclone was reported; 34° 50 north, 75° 50 west, heavy northeast gale. The following wind-velocities are given: Port Huron, northeast 25; New River, N. C., east, high; Sandy Hook, north 32; Portland and Thatcher's Island, northwest, 28; Mount Washington, northweat, 72, and off Cape Henry a heavy easterly gale. On Mount Washington a northwest hurricane continued on the 21st and 22d. During its passage, the only reports of very brisk and high winds at the lake stations came from Escanaba and Port Huron. Along the New England and New Jersey coasts, after the winds shifted to the northwest, they occasionally increased to high during clear weather. Cautionary signals were displayed for northeasterly winds along the Virginia and Carolina coasts, which were justified.

No. VI.—On the 19th, while high pressure No. V was advancing southward over the Northwest, falling barometer and warmer southerly winds prevailed in Montana and Utah, and continued on the 20th, which conditions extended eastward to Dakota, Nebraska, and Colorado, on the latter date. In Nebraska and Kansas, occasional thunder-storms and brisk to high southeasterly winds prevailed, with a wind-velocity of 42 miles at Bismarck; on Pike's Peak a hail and snow storm. During the 21st, the central depression advanced southeastward into Southern Dakota, with thunder-storms in Colorado, Nebraska, Kansas, and Iowa, very heavy rain at Davenport, and a destructive rain and hail storm at Denver. At Dodge City the wind velocity reached south 40 miles. On the 22d, it was forced to move nearly due northward by the high-pressure area which covered the Lower Lake region, Middle and South Atlantic States. On Pike's Peak a violent gale prevailed; at Dodge City, south 39, and at North Platte, south 46 miles were recorded. Thunder-storms occurred in Dakota, Wisconsin, Iowa, and Michigan, accompanied by very heavy rains at La Crosse and Breckenridge. During the 23d, the center probably passed over Fort Garry into Canada, with occasional thunder-storms in Iowa, Wisconsin, and Michigan. Cautionary signals were displayed on the 22d and 23d at Duluth, but were not justified.

No. VII succeeded the previous one in Dakota during the night of the 23d, and rapidly advanced to the north of the Upper Lake region during the 24th. Frequent thunder-storms accompanied it from Wisconsin, Iowa, Kansas, and Missouri east and southward to Ohio, West Virginia, Carolinas and Tennessee. At Wheeling, W. Va., Centertown, Mo., and Nashville, they were reported as very heavy and destructive. On the 25th, the central disturbance reached the Saint Lawrence Valley, with a barometric trough extending southwestward toward the Gulf States, and occasional thunder-storms over that area. The following wind-velocities were recorded: Marquette, west, 32; Barnegat, southwest, 27; Cape May, south, 28, and Sandy Hook, northwest, 34 miles. On the 25th, it passed eastward over the Gulf of Saint Lawrence, followed by clearing weather in the Middle States and New England. A minor depression was left in the South Atlantic States, which produced occasional thunder-storms. Cautionary signals were ordered along the lakes, which were justified, excepting those along Lake Ontario; also along the Middle Atlantic coast, but were justified along the New Jersey coast alone.

No. VIII.—During the 27th and 28th, the pressure continued diminishing at the Rocky Mountain stations and in the Northwest, with occasional thunder-storms from Kansas to Dakota and Minnesota, and on the morning of the 29th it was apparently central in southeastern Dakota. During the day occasional thunder-storms occurred in Dakota, Wisconsin, Iowa, Illinois, and Michigan; north of Pembina, a violent hail-storm; at Milwaukee, heavy and damaging rain-storm; in Grant County, Wis., very heavy rains, producing destructive floods; at Guttenburg, Iowa, 4.25 inches rain fell, causing damaging floods. On the 30th thunder-storms continued in Colorado, Nebraska, Missouri, Iowa, Minnesota, Illinois, Indiana, and Ohio, with a destructive gale at Logansport, Ind., and a hail and snow storm on Pike's Peak. At midnight the central disturbance was located near Fort Garry. On the 31st, during its progress eastward, a barometric trough extended southward toward Indian Territory, in which frequent and heavy thunder-storms prevailed. The hail and snow storm continued on Pike's Peak. A destructive hail-storm was reported from Alpena, where the wind-velocity reached northwest 28 miles. At Sagetown, Ill., a destructive wind storm occurred. Its movement upon the 1st and 2d of September is shown upon the chart, but its description for those dates belongs to that month. There were no cautionary signals displayed along the lakes, and the only high wind was reported from Alpena.

Local storms.—On the 2d the wind shifted temporarily to north, 29, at Galveston, and to north, 44 miles at Indianola, during heavy thunder-storms, while hail-stones as large as hen's eggs fell at former; 3d, at Mobile, during a thunder-storm, the wind reached south, 30 miles; 7th, at Punta Rassa, heavy thunder-storm and wind-velocity 36 miles; 8th, Logansport, Ind., heavy rain-storm, flooding streets, cellars, &c.; 9th, at Fort McKavett, Tex., heavy rain-storm during night with 3.24 inches rain-fall; 10th, violent rain-storm and high northwest wind at New River, N. C., coast; 13th, thunder and hail storm at Spartanburg, S. C.; 19th, tornado at Edgerton, Mo., severe storms in Platte County, Mo., Saint Louis, and Atchison, Kans.; 21st, high southeast wind

during thunder-storm at Mobile; 22d, terrific northwest squall during thunder and hail storm, latitude 42° 28′ north, longitude 58° 55′ west; 24th, severe thunder-storm at Aiken, S. C.; 25th, violent thunder-storm, during which several persons were stunned or fainted from the concussion and proximity of one crash, at Fort Duncan, Tex., fierce thunder-storm at Pittsburgh, and heavy at Spartanburg, S. C.; 26th, hurricane experienced by a vessel in the vicinity of Bermuda; 27th, high easterly winds during thunder-storm early in the morning at Cape Hatteras and New River, N. C., coast; 28th, heavy gale 150 miles off shore from San Francisco.

TEMPERATURE OF THE AIR.

The isothermal curves upon chart No. II illustrate the general distribution of the temperature of the air for the present month. From a reference to the table in the lower left-hand corner of the same chart, it will be seen that the average is below that for many years in the Gulf States, Upper Mississippi Valley, and at the Pacific Coast stations; about the same in Minnesota and the Lower Missouri Valley; above in the remaining districts, especially in the Lake region and Saint Lawrence Valley. Minimum and maximum temperatures, respectively, for the month are given for the following stations, viz: Albany, 46°, 93°; Alpena, 42°, 87°; Atlantic City, 55°, 87°; Augusta, 70°, 97°; Boston, 50°, 96°; Bismarck, 42°, 105°; Breckenridge, 37°, 101°; Buffalo, 46°, 87°; Cairo, 63°, 95°; Cape Hatteras, 62°, 85°; Cape May, 57°, 87°; Cheyenne, 34°, 92°; Chicago, 54°, 92°; Cincinnati, 59°, 91°; Cleveland, 46°, 86°; Corsicana, 68°, 101°; Davenport, 53°, 90°; Denver, 44°, 100°; Detroit, 46°, 87°; Dodge City, 52°, 101°; Duluth, 45°, 89°; Eastport, 46°, 83°; Fort Gibson, 64°, 95°; Fort Sully, 48°, 107°; Indianapolis, 48°, 89°; Indianola, 71°, 99°; Jacksonville, 70°, 98°; Key West, 75°, 91°; Leavenworth, 55°, 93°; Lynchburg, 58°, 94°; Malone, 37°, 92°; Marquette, 44°, 91°; Mobile, 71°, 95°; Mount Washington, 20°, 72°; Nashville, 60°, 95°; New London, 52°, 87°; New Orleans, 73°, 92°; New York, 55°, 90°; North Platte, 42°, 97°; Omaha, 54°, 92°; Oswego, 52°, 90°; Pembina, 36°, 94°; Pittsburgh, 49°, 97°; Pike's Peak, 23°, 58°; Philadelphia, 56°, 91°; Portland, Oreg., 51°, 91°; Salt Lake City, 46°, 95°; San Diego, 60°, 81°; San Francisco, 51°, 78°; Santa Fé, 45°, 89°; Shreveport, 69°, 96°; Vicksburg, 68°, 98°; Virginia City, 31°, 92°; Washington, 53°, 96°; Wilmington, 63°, 97°; Wood's Hole, 55°, 85°; Yankton, 46°, 93°; Yuma, 67°, 107°. The highest were recorded at Indianola on the 1st; Denver, 12th; Dodge City, 18th; Breckenridge and Bismarck, 8th; Fort Sully, 7th; Yuma, 6th; and the lowest at Mount Washington, 21st; Pike's Peak, 23d; Breckenridge, 25th; Malone, 21st; Pembina, 26th; Cheyenne, 10th; and Virginia City, 9th. The maximum temperatures for Mount Washington and Virginia City are the highest on record for those stations. During the first part of the month, at the 4.35 p. m. (Washington time) observations, the temperature frequently ranged from 100° to 114° at the stations in western Texas, along the Rio Grande River, while in Arizona the readings varied between 100° and 111°. At Fort Duncan, Texas, 2 p. m., 2d, the temperature reached 113°. It fell at Rockford, Iowa, from 83°, at 1 p. m., to 68°, at 2 p. m., on the 18th; at Leavenworth, from 90° to 68°, in half an hour, on 19th; at Memphis, from 92° to 79°, in fifteen minutes, on 22d; at Riley, Ill., decided fall from 24th to 25th, the mean of latter having been 18° lower than that of former; at Cresswell, Kans., fall of 40° on the 24th, and 41° on the 31st.

Ranges in temperature.—At Key West, 16°; San Diego, 21°; San Francisco, 27°; Portland, Oreg., 41°; Gulf States, 19° to 33°; South Atlantic States, 23° to 34°; Indian Territory, 29° to 34°; Tennessee and the Ohio Valley, 30° to 38°; Middle Atlantic coast, 30° to 43°; New England coast, 28° to 44°; interior of Middle States and New England, 42° to 55°; Lower Lake region, 35° to 44°; Upper Lake region, 38° to 47°; Upper Mississippi Valley, 31° to 47°; Lower Missouri Valley, 36° to 47°; Red River of the North Valley, 58° to 64°; Santa Fé, 44°; Kansas and Colorado, 35° to 56°; Salt Lake City, 49°: Wyoming, Montana, and western portions of Nebraska, Minnesota, and Dakota, 55° to 64° at Breckenridge.

Ice and destructive frosts have been reported as follows, viz: Morning of the 10th at Coalville, Utah, frost injuring wheat and potato tops; 21st, near Port Huron, Mich., frost damaging crops; 26th, at Pembina, frost injuring vegetation; 31st, at Coalville, frost and first skim of ice. July 8, a severe frost occurred at Carson City, Nev., freezing vegetables.

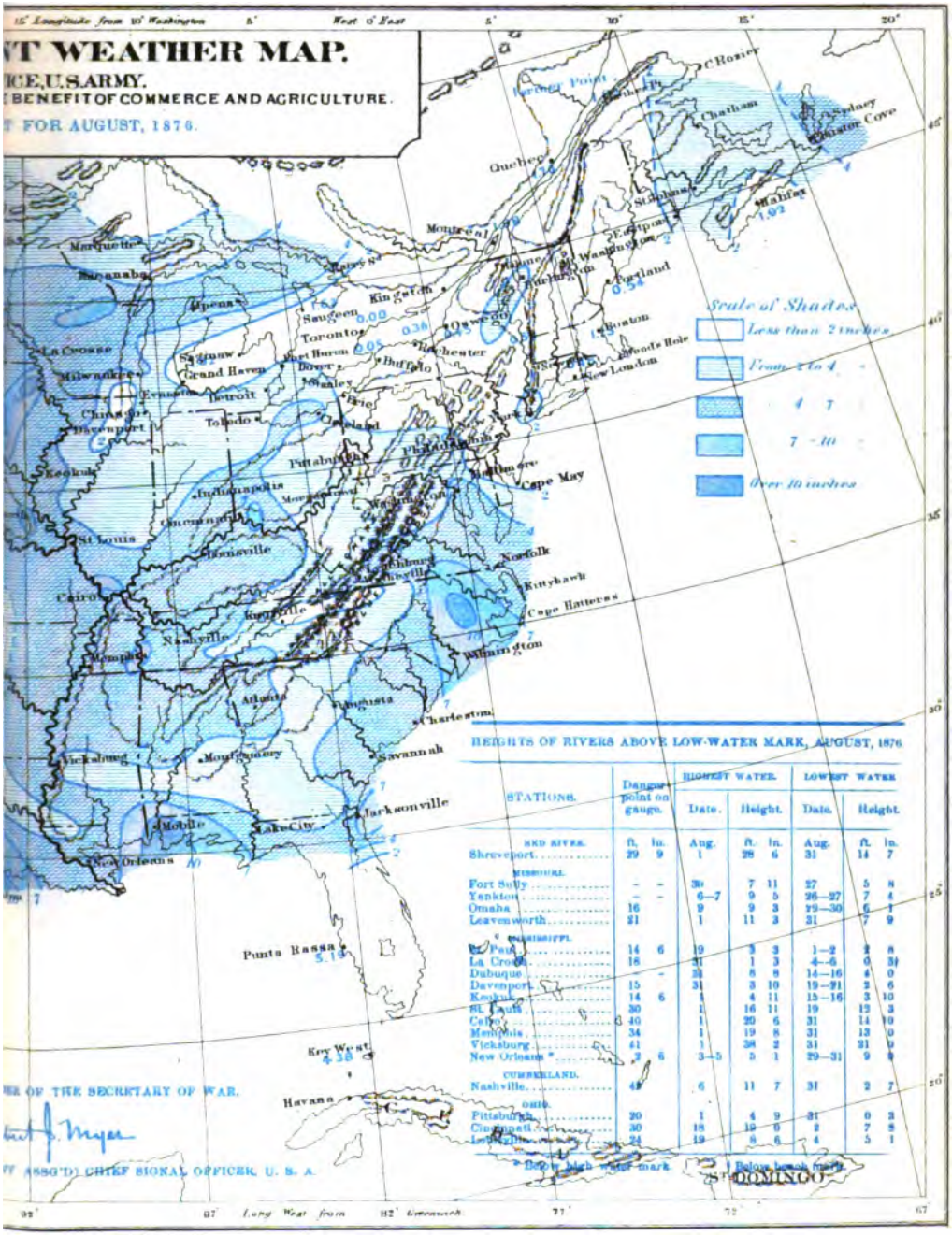
PRECIPITATION.

Upon chart No. 3 is represented the distribution of the rain-fall and melted snow. The table in the lower left-hand corner of same gives the average precipitation, in the various districts, of the month for this and for many years. It will be observed that the regions in which the rain-fall has exceeded the average for years, viz, the Missouri Valley, Upper Mississippi Valley, Minnesota, Tennessee, and the Ohio Valley, generally correspond with those affected by the movements of the lower-pressure areas. The excess in the Western Gulf States, and the normal in the Eastern Gulf States, result



AVERAGE PRECIPITATION FOR AUGUST

DISTRICTS	Average for August. For many years.	Average for August. For 1878.	Comparison of August, 1878, with the average for many years.
	Inches.	Inches.	
St. Lawrence valley	2.95	1.27	Large deficiency
New England	4.05	1.00	Very large deficiency
Middle Atlantic States	4.60	2.35	Large deficiency
South Atlantic States	6.50	6.45	Normal.
Eastern Gulf States	5.90	5.70	Normal.
Western Gulf States	3.85	4.30	Small excess.
Lower Lake region	3.00	1.95	Large deficiency
Upper Lake region	3.90	3.50	Small excess.
Ohio Valley and Tennessee	3.45	4.65	Excess.
Upper Mississippi Valley	3.56	5.10	Excess.
Lower Missouri Valley	3.95	4.90	Excess.
Upper Missouri Valley	2.96	4.15	Large excess
Minnesota	3.60	4.80	Excess.
Pacific Coast	0.98	0.71	Normal.



STATIONS.	Danger point on gauge.	HIGHEST WATER. Date.	Height.	LOWEST WATER. Date.	Height.
	ft. in.	Aug.	ft. in.	Aug.	ft. in.
RED RIVER.					
Shreveport	29 9	1	28 6	31	14 7
MISSOURI.					
Fort Sully	– –	30	7 11	27	5 8
Yankton	– –	6–7	9 5	26–27	7 4
Omaha	16	9	9 3	29–30	6 1
Leavenworth	21	1	11 3	31	7 9
MISSISSIPPI.					
St. Paul	14 6	19	3 3	1–2	1 8
La Crosse	18	31	1 3	4–6	0 3½
Dubuque	–	31	8 8	14–16	4 0
Davenport	15	31	3 10	19–21	2 6
Keokuk	14 6	1	4 11	15–16	3 10
St. Louis	30	1	16 11	19	13 3
Cairo	40	1	20 6	31	14 10
Memphis	34	1	19 8	31	13 0
Vicksburg	41	1	38 2	31	31 0
New Orleans	3 6	3–5	5 1	29–31	9 8
CUMBERLAND.					
Nashville	40	6	11 7	31	2 7
OHIO.					
Pittsburgh	30	1	4 9	31	0 3
Cincinnati	50	18	19 6	2	7 8
Louisville	24	19	8 6	4	5 1

UNDER THE SECRETARY OF WAR.

(Signed) A. J. Myer

BVT. MAJ. GEN'L (ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.

from the heavy precipitations at Galveston and Mobile, while there was a deficiency at the majority of the stations, especially through the central portions. The large deficiencies in the Lower Lake region, Middle States, New England, and Saint Lawrence Valley are due to the fact that the low-pressure areas generally passed to the north of them, and only occasionally extended their influence southward, so as to produce rain in those sections. The following are some of the largest total rain-falls, viz: at Galveston, 10.19 inches; Mobile, 11.53; Goldsborough, N. C., 11.61 (?); Boonsborough, Iowa, 12.44 (?); Guttenburg, Iowa, 10.04; Richmond, Nebr., 8.12; Camp Verde, Ariz., 12.08; Anna, Ill., 9.41; near Cincinnati, 10.25, and Snowville, Va., 9 inches. Stations where not any rain fell are: San José and Campo, Cal., Fort Porter (near Buffalo), Fort Niagara (at Oswego), Toronto, Fort Hall, Idaho, Camp McDermit, Nev., Yuma and Fort Griffin, Tex. Those recording less than one-tenth (0.1) of an inch are: San Francisco, .01; Andover, Mass., .03; West Point, N. Y., .05; San Diego, Coalville, Utah, and Rio Grande, Tex., .06; Standish, Me., .07, and Carson City, Nev., .08 inch. At Caperville, Va., 4.70 inches of rain is reported to have fallen on the 29th, and at Fort McKavett, Texas, 3.24 inches during the night of the 9th and 10th.

Snow-fall.—Light snow fell at Virginia City on the morning of the 9th, on Mount Washington early during the morning of the 23d, and on Pike's Peak on the 3d, 4th, 6th, 13th, 20th, 26th, 27th, and 30th. Heavy snow on Pike's Peak on the 18th, 19th, and 31st.

Hail.—1st, heavy on Pike's Peak; 2d, at Dubuque, and large at Galveston; 6th, at Vevay, Ind., and heavy on Pike's Peak; 7th, at Honesdale, Pa.; 8th, at Pembina and on Pike's Peak; 9th, at Alto Vista, Va., Atlanta, Ga., and on Pike's Peak; 13th, at Spartanburg, S. C.; 15th, track three miles wide and six long, destroying fruits, vegetables, &c., between Wappinger's Falls and Poughkeepsie, N. Y.; 16th, at North Platte; 17th, Pike's Peak and Pembina; 19th, Le Roy, Kans.; 20th, Pike's Peak; 21st, Denver; 28th, violent at Kanab, Utah; 29th, between Pembina and Fort Garry, track three miles wide, and stones from one to seven inches in circumference; 30th, Pike's Peak; 31st, heavy at Alpena and on Pike's Peak.

Cloudy days.—The number of cloudy days, as reported by the volunteer observers, ranges as follows in the various districts: New England, 0 to 7; Middle States, 0 to 11; South Atlantic States, 1 to 9; Eastern Gulf States, 3 to 9; Western Gulf States, 0 to 5; Arkansas, Tennessee, and the Ohio Valley, 3 to 13; Lake region, 0 to 9; Northwest, 0 to 11.

Rainy days.—The number of days on which a greater or less quantity of rain fell averages as follows: New England, New York, and Northern Pennsylvania, 4; South Atlantic and southern portion of the Middle States, 12; Ohio Valley, Tennessee, and Eastern Gulf States, 15; Western Gulf States, Upper Lake region, and western portion of Lake Erie, 11: Northwest, 12.

Droughts.—Florida: Mayport, ground very dry, season unusually sickly. Illinois: Riley, rain needed 23d. Maine: Standish reports drought very severe, streams dry, and wells low; West Waterville, dryest August ever recorded. New Hampshire: Plaistow, during the month rain upon one day only: Shelburne, very severe, and water scarce: Auburn and Contoocookville, very severe, springs and wells failing. Vermont: reports from all stations show the month to have been exceedingly dry, and crops damaged in some sections. Massachusetts: Amherst, vegetation scorched; Mendon, streams and wells low. New York: Ardenia, corn, potatoes, and gardens destroyed, springs and streams low; Albany, severe during almost the entire month; Brookhaven, severe; Elmira, severely felt; Essex County, no rain for weeks, country very dry, and much vegetation destroyed; Flushing, 20th to close of month; Kensico, gardens destroyed; Malone, severe, no rain for four weeks; Nichols, corn and buckwheat damaged; Pine Plains, crops of all kinds damaged; Port Jervis, very severe, most streams and ponds nearly dry, and no rain since June 30; Saint Lawrence County, very severe, farmers feeding grain to cattle to prevent starvation; Starkey, month dry, no great damage; Wappinger's Falls, long and severe from July 31 to August 31, and at close of month not enough water in streams to run factories. New Jersey: Freehold, very severe; Newark, month dry, fruits suffering; New Germantown, month dry, vegetation suffered very much; Vineland, ground dry at close of month. Pennsylvania: Blooming Grove, only one-tenth of an inch of rain; Erie, vegetation suffering greatly; York Sulphur Springs, a narrow region eight or ten miles long and from five to eight in width, during most part of summer almost destitute of rain, while the adjoining country on all sides enjoyed a favorable agricultural season; Tioga, streams very low, probably the dryest period in 80 years. Tennessee: local droughts reported in the eastern portion. Virginia: Wytheville, from the 18th. Michigan: Litchfield, gardens injured. Texas: Corsicana, cotton crop greatly injured, and stock suffering for want of water.

Floods.—Not mentioned above, near Wytheville, Va., about the 1st, sweeping away hay, fencing, &c.; 8th, at Logansport, Ind., a very heavy rain, flooding streets, cellars, &c.; 17th, at Fort Sully, heaviest rain-storm ever known, and on the opposite side of the river the water, draining from a cañon, is reported to have moved out in a solid bank 3 feet deep and 200 feet wide; 26th, near Hays City, Kans., a water-spout burst

over Kill Creek, causing destructive floods, and in the mountains east and west of Kanab, Utah, floods damaged roads and ditches; 28th, at Neillsville, Wis., heavy rain, damaging railroads; 31st, on Chalk Creek, five miles from Coalville, Utah, a "cloud-burst" was reported, and a solid bank of water, between three and four feet high, came down the stream, destroying dams, &c.

RELATIVE HUMIDITY.

The average relative humidity for the month ranges, at the Atlantic coast stations, from 72 to 79 per cent.; in the interior of New York and New England, 59 to 69; in Maryland, Virginia, and the South Atlantic States, 69 to 75; in the Gulf States and Tennessee, 69 to 78; in the Lake region and Ohio Valley, 62 to 78; in the Upper Mississippi and Lower Missouri Valleys and Minnesota, 68 to 74; on the plains of Kansas, Nebraska, and Dakota, 59 to 64; at the Rocky Mountain stations, 29 to 68, and on the Pacific coast, 64 to 74. *Moist stations:* Atlantic City and Thatcher's Island, average, 79 per cent.; Mobile, 78; Saint Mark's, Knoxville, Pembina, and Cairo, 77; Memphis, Tybee Island, Cape Hatteras, Cape May, Barnegat, and Mount Washington, 76. *Dry stations:* Salt Lake City averages 29 per cent.; Cheyenne, 38; Virginia City, 41; Denver, 42; Bismarck, North Platte and Malone, 59; Fort Sully and Albany, 61; Rochester, 62; Buffalo, 63; Dodge City and New York, 64.

WINDS.

Prevailing winds.—The points of the compass from which the winds have blown most frequently during the month will be seen by examining Chart No. II, the arrows flying with the wind. At Campo, Cal., the prevailing winds have been from the W.; Yuma, S.; Bismarck, NW.; Fort Sully, SE.; Smithville, N. C., SW.; Kittyhawk, N. C., E.; Sandy Hook, SE.; Barnegat, E.; Atlantic City, NE.; Thatcher's Island, SW.

The *maximum velocities* are given in the description of the movements of the low-pressure areas. On the summit of Mount Washington the highest velocities occurred on the 21st and 22d, and on Pike's Peak on the 22d.

Total movements.—The largest total movements of the air during the month, independent of direction, have been recorded at the following stations, viz: Breckenridge, 11,323 miles; North Platte, 11,239; Fort Dodge, 11,196; Pike's Peak, 9,635; Cape May, 8,886; San Francisco, 8,790; Barnegat, 8,511; Fort Sully, 8,476; Sandy Hook, 8,140; Indianola, 7,910; Cheyenne, 7,870; Cape Lookout, 7,851. It has been impossible to obtain a continuous record on Mount Washington. The smallest movements have occurred at Lynchburg, 1,807 miles; Savannah, 1,963; Augusta, 2,129; Louisville, 2,172; Morgantown, 2,208; Nashville, 2,279; Vicksburg, 2,302; Shreveport, 2,701; Memphis, 2,769; Springfield, 2,790; Savannah, 2,855; New London, 2,935; Cincinnati, 2,898.

VERIFICATIONS.

Probabilities.—As worked up three times daily and issued to the public, they have been carefully compared with the actual conditions during the succeeding twenty-four hours, and the following result obtained: The percentage of verifications has averaged 86.13 for New England, 86.83 for the Middle States, 88.23 for the South Atlantic States, 87.68 for the Eastern Gulf States, 88.91 for the Western Gulf States, 86.52 for Tennessee and the Ohio Valley, 88.60 for the Lower Lake region, 90.20 for the Upper Lake region, 86.99 for the Upper Mississippi Valley, and 82.44 for the Lower Missouri Valley. The average for the whole country is 87.25 per cent. For the weather, 85.88; wind direction, 92 33; temperature, 88.62; barometric changes, 82.20 per cent. have been obtained. There were four omissions to predict out of 3,720, or 0.1 per cent.

Cautionary signals.—During the month 52 signals were ordered to be displayed at the different stations along the South Atlantic and Middle Atlantic coasts, and the lakes. Of these, 1 was ordered late, 34 have been reported as justified, and 17 not justified. Warnings were sent for two Canadian stations along Lake Huron on the 10th, but are believed to have been not justified. Thirty-four cases have been reported from scattered stations, where the wind-velocity reached 25 miles, and over, per hour without the display of signals, viz, on the 1st, Cape Henry, northeast, 36 miles; Kittyhawk, east, 28; Cape Hatteras, south, 34; 2d, Galveston, northwest, 29; Indianola, north, 44; 3d, Mobile, south, 30; 6th, Key West, east, 25; 7th, Saint Mark's, southwest, 26 (squall); 8th, Marquette, south, 30; 10th, Key West, east, 30; Cape Lookout, northwest, 26; 12th, Savannah, east, 40; 13th, Indianola, south, 27; 14th, Escanaba, north, 28; 18th, Cape Lookout, west, 30; 19th, Escanaba, north, 32; 20th, Sandy Hook, north, 32; Boston, northwest, 32; Thatcher's Island, northwest, 28; Portland, Me., northwest, 28; Port Huron, northeast, 25; 21st, Mobile, southeast, 29; Cape Lookout, northeast, 28; Cape Hatteras, northeast, 26; 22d, Boston, west, 26; 24th, Mobile, southeast, 28; 26th, Buffalo, west, 26; Alpena, northwest, 28; 27th, Kittyhawk and Cape Hatteras, north-

east, 28; Cape May, north, 32; Sandy Hook, northwest, 29; Portland, Me., northwest, 26; 31st, Alpena, northwest, 28. In a great many cases they occurred during local thunder-storms, and were of short duration.

NAVIGATION.

Height of rivers.—Upon Chart No. III is printed a table giving the highest and lowest marks, with the dates upon which they occurred. In the Red River there has been a steady decline at Shreveport during the month, excepting a temporary rise of 30 inches on the 11th. The Missouri fell slowly at Fort Sully, up to the middle of the month; after a sudden rise of one foot it continued slowly falling till the 27th, then rose to its maximum on the 29th. At Yankton and Omaha it changed but slightly until reaching its maximum, after which the fall was quite regular until the minimum was reached, when a rise of a few inches closed the month. At Leavenworth it fell quite regularly up to the 20th; after a rise of 1 foot on the 21st its decline was steady. The Upper Mississippi continued quite low throughout the month. At Keokuk navigation was greatly impeded. At Saint Louis, after falling steadily and reaching its minimum, it rose to 14 feet 4 inches on the 27th, and then continued slowly falling. The Lower Mississippi fell quite steadily throughout the month, excepting slight rises at Cairo on the 13th and 24th, and at Memphis on the 17th and 26th. An immense sand-bar formed during the first week at the lower side of the "cut-off" below Vicksburg, and De Soto, La., extending from the right bank of the river in a southeasterly direction. At Nashville the Cumberland fell from the 1st to the 3d, rose to the 6th, fell 5 feet to the 12th, rose 5 feet on the 13th, slowly fell 8 feet to the 25th, and rose 1 foot the 26th, after which its decline was regular. The changes in the Ohio were of slight importance, except at Cincinnati, when a rise of over 11 feet occurred between the 15th and 18th. At Pittsburgh, navigation was nearly suspended the 11th, and the Alleghany said to be lower on the 14th than for many years. At Augusta, the Savannah River reached its highest point, 16 feet 6 inches, on the 1st, from which there was almost a steady decline until it reached its minimum, 5 feet 8 inches, on the 30th. At Trenton, N. J., the Delaware River was 1 inch lower on the 27th than it had been during the past fifty-four years. On 30th, river extremely low at Breckenridge. Connecticut River very low on 31st at Westminster, Vt. Delaware and Lackawanna Rivers 14 inches below lowest recorded low-water mark, 1836, in vicinity of Honesdale, Pa.

TEMPERATURE OF WATER.

As heretofore, the maximum and minimum temperatures alone, with the average depth of the water, are given in the table on the lower right-hand corner of Chart No. II. The least range, of 3°, was recorded at Eastport and Saint Marks, and the greatest, of 24°, at Burlington, Vt.

ATMOSPHERIC ELECTRICITY.

A peculiar electrical display was observed on Pike's Peak during the evening of the 18th. It was attended by a strange singing or rather sizzing on the wire, which was distinctly illuminated for an eighth of a mile, the electricity being thrown off in brilliant scintillations. Every metallic point and surface were also tipped or covered with light, the entire atmosphere having been apparently highly charged with electricity. Snow was falling at the time, and the air was very humid. At Omaha, during the afternoon of the 16th, communication by telegraph was interrupted by the electricity on the wires, and the electrical fire-alarms were repeatedly sounded.

Thunder-storms.—The sections in which they have occurred have been very generally mentioned in giving the details under the head of low-pressure areas. The dates, States, and number of stations in each State, when more than one, are: 1st, Florida 3, Nebraska, Tennessee, South Carolina, Georgia 2, and Colorado 2; 2d, Tennessee 2, Dakota 2, Texas, 2, Alabama and Florida; 3d, Dakota, Georgia 3, Wisconsin, Alabama, Tennessee, and Minnesota; 4th, Alabama 2, Kansas, South Carolina, Georgia 2, Indiana, Iowa 3, Kansas 3, Michigan 3, Ohio 2, Tennessee 2, Wisconsin 5, and Florida; 5th, Dakota, Minnesota 3, Illinois, Iowa 5, Kansas 3, Missouri, Nebraska 4, Ohio 4, Tennessee, Michigan, West Virginia, Indiana, New York, Alabama, Pennsylvania, Kentucky, and Georgia; 6th, Illinois 3, Louisiana, Maine, Michigan, New York 2, Ohio, Pennsylvania, Tennessee, Vermont, Virginia, Alabama, North Carolina, Iowa, Florida, and Georgia; 7th, Arkansas, Connecticut, Florida 2, Illinois, Indiana 2, Maine, Massachusetts 5, New York 3, Ohio 3, Pennsylvania, Vermont, Virginia, West Virginia, South Carolina, Alabama, Texas, and Georgia; 8th, Alabama, Illinois, Tennessee 3, Virginia 2, Indiana 2, Ohio, Maryland, Florida, Dakota, and Indian Territory; 9th, Alabama 2, Illinois 3, Minnesota, Ohio 2, South Carolina 2, Tennessee, Virginia, Wisconsin, Dakota, Mississippi, North Carolina 2, Florida, Indiana 2, Texas, Kansas, and Maryland;

10th, Georgia, Illinois, Iowa 2, Louisiana, Michigan, North Carolina 2, Ohio 3, Tennessee 2, Wisconsin, Virginia 2, Indiana 2, Alabama, Maryland 2, and Dakota; 11th, Iowa, Kentucky, Michigan 2, Ohio 2, Pennsylvania, South Carolina, Mississippi, and West Virginia; 12th, Connecticut 2, Indiana, Kansas, Massachusetts, South Carolina, Alabama, Colorado, Maryland, Texas, Dakota, and Pennsylvania; 13th, Illinois 2, Florida 2, Georgia 2, Iowa 2, Minnesota, Massachusetts, Missouri, Nebraska 3, Pennsylvania, South Carolina 2, Texas 2, West Virginia, Maryland, Kansas, and Wisconsin; 14th, Kansas 2, Florida 2, Missouri 2, Nebraska, Ohio, South Carolina 2, and Alabama; 15th, New York, Connecticut, Illinois, Kansas, Maine 5, Massachusetts 5, Ohio, Tennessee, Florida, Alabama 2, Mississippi, and North Carolina; 16th, Illinois 2, Iowa 4, Kansas, Nebraska 3, Indiana, Ohio, Alabama, Kentucky, and Florida; 17th, Illinois 2, Kentucky 2, Minnesota, Nebraska 3, Ohio 2, Virginia 2, South Carolina, Pennsylvania 2, Kansas, New Jersey 2, Iowa 2, West Virginia, Florida, and Dakota 3; 18th, Minnesota, Illinois 2, Indiana 2, Iowa, Kansas, Michigan, Ohio 2, South Carolina, Wisconsin, Alabama, North Carolina 3, Nebraska, and Dakota; 19th, Kansas 4, Michigan, Missouri, Nebraska, New York 3, South Carolina, and Alabama; 20th, Nebraska 3, Kansas 2, Louisiana, Wisconsin, New Hampshire, New York, South Carolina, Tennessee, Vermont 2, Maine, and Alabama 2; 21st, Iowa, Nebraska 3, Florida. Colorado, Alabama, and Kansas; 22d, Dakota, Minnesota 2, Iowa 2, Michigan 2, Wisconsin 2, Alabama, and Florida; 23d, South Carolina, Iowa 2, Wisconsin, and Michigan 2; 24th, North Carolina, Georgia, Illinois 2, Iowa 4, Kansas, Missouri 2, Ohio 5, Tennessee 3, Wisconsin 5, South Carolina, Indiana, Alabama, West Virginia, and Michigan; 25th, Pennsylvania 2, New York, Georgia, Louisiana, Maine, Massachusetts 2, North Carolina 2, Tennessee, Vermont 2, South Carolina, Texas 2, Mississippi, West Virginia, and Alabama; 26th, North Carolina 2, South Carolina 2, Maine 3, Massachusetts, Pennsylvania 2, Vermont, Missouri, Texas, and Georgia; 27th, Florida 2. Georgia 2, Pennsylvania, North Carolina, Dakota, Alabama, and Texas; 28th, Iowa 2, Kansas, Louisiana 2, Nebraska, Minnesota, Georgia, Florida, and Mississippi; 29th, Alabama 2, Illinois 2, Iowa 4, Louisiana, Wisconsin 2, Dakota, Michigan, and Florida; 30th, Illinois 3, Indiana 4, Iowa 3, Massachusetts, Missouri 2, Nebraska 2, Nevada, Ohio 2, Minnesota, and Colorado; 31st, Illinois 5, Iowa 2, Kansas 3, Michigan, Nebraska 2, Nevada, Ohio 2, South Carolina 2, Tennessee 3, North Carolina, Kentucky, and Florida.

Auroras.—That of the 25th was most extensively observed. Displays were reported as having been seen on the 1st at Buffalo; 3d, Mount Auburn, Ohio; 10th, Cornish, Me.; 11th, Vevay, Ind., Gardiner, Me., and Duluth; 12th, Embarrass and Leroy, Wis., and Escanaba; 13th and 14th, Pembina; 15th, Auburn, N. H., and Pembina; 16th, Leroy, Wis., and Pembina; 17th, Pembina; 18th, Eastport; 19th, Pembina; 20th, Marquette; 21st, Washington; 24th, Duluth; 26th, Fort Stevenson, Dak., Cresco and Ames, Iowa, Duluth, Saint Paul, and Utica, Wis., Escanaba, Alpena, Port Huron, Erie, Buffalo, and Gardiner, Me.; 28th, Gardiner, Me., and Duluth; 29th, Gardiner, Me.

OPTICAL PHENOMENA.

Solar halos.—1st, Iowa, Tennessee; 3d, Georgia, Indian Territory; 4th, North Carolina; 5th, Mississippi, Ohio; 6th and 7th, South Carolina; 8th, Mississippi, Ohio; 9th, Ohio; 10th, North Carolina; 11th, West Virginia; 12th, Illinois, Georgia, Iowa, Alabama; 14th, New Jersey, Georgia; 15th, Michigan, Louisiana; 16th, Kansas; 17th, Illinois, Pennsylvania; 18th, New York, Illinois; 19th, Indiana, South Carolina, Kansas, Maine; 20th, Florida; 22d, New Jersey, New York; 23d, Kentucky, Ohio; 24th and 25th, Maine; 26th, Illinois, Wisconsin, Georgia; 27th, Georgia, Michigan, Wisconsin; 28th, Illinois, Wisconsin, Michigan, New Mexico; 29th, Ohio, Michigan; 30th, Illinois, Michigan, Ohio, Georgia; 31st, New Jersey, Louisiana.

Lunar halos.—1st, Iowa, Massachusetts, New York, Minnesota; 2d, Connecticut, Alabama; 3d, North Carolina, Massachusetts; 4th, Minnesota, North Carolina; 5th, Tennessee, Pennsylvania, North Carolina, New York, Dakota; 6th, New York, Maine, Alabama, Minnesota. Louisiana, Florida; 7th, Michigan, South Carolina, New York, Ohio, North Carolina; 8th and 9th, Ohio, North Carolina, Florida; 10th, Michigan, Florida; 11th, North Carolina, Florida; 12th, District of Columbia; 13th and 23d, Kentucky; 24th, Maryland, Pennsylvania, Virginia; 25th, Maine, Georgia, New Mexico; 27th, North Carolina, Florida; 28th, North Carolina, Missouri, Georgia; 29th, Indiana, New York. Ohio, Georgia, North Carolina, Missouri, Maine; 30th, Iowa, Maine, Ohio, Minnesota, Georgia, North Carolina, Michigan; 31st, Indiana, Ohio, Pennsylvania, Iowa.

Mirage.—4th, Dodge City; 5th, Dodge City, Breckenridge; 11th, Breckenridge; 13th, New London, Revere Beach, Mass.; 21st, New London; 23d, Breckenridge; 26th, Moorhead, Minn.; 27th, Breckenridge.

Meteors.—1st, Wooster, Ohio, Buffalo; 2d, Vevay, Ind.; 3d, Lyndon, Ill., Smithville, Davenport; 4th, Carbondale, Ill., Ellinwood, Kans., Trenton, N. J.; 6th, Nottoway Court-House, Va., Davenport; 7th, Freehold, N. J., Hanover, Pa., Davenport; 8th, Ellinwood, Kans., Woodstock, Md., Fall River, Mass., Richmond, Nebr., Freehold, N. J., Wautoma, Wis., Dubuque, Malone, Davenport; 9th, Lyndon, Ill., New Harmony, Ind.

(brilliant), Vevay, Ind., Woodstock, Md., Fall River, Mass., Corning and Frankford, Mo., Waterburg, North Volney, and Flushing, N. Y., Duluth, Smithville, Morgantown, Detroit, Davenport; 10th, Lyndon, Ill., New Harmony, Ind., Vevay, Ind., Ellinwood, Kans., Woodstock, Md., Fall River, Mass., Richmond, Nebr., Carson City, Nev., Trenton, N. J., Waterburg, N. Y., Mount Auburn, Ohio, Dubuque, Dodge City, Morgantown, Malone; 11th, Lyndon, Ill., Vevay, Ind., Muscatine, Iowa (10 to 10.45 p. m. 50 meteors observed), Ellinwood, Kans., Corning and Oregon, Mo., Richmond, Nebr., Carson City, Nev., Trenton, N. J., Waterburg, N. Y., Cincinnati, Dodge City; 12th, Lyndon, Ill., Monticello, Iowa, Ellinwood, Kans., Richmond, Nebr., Carthagena and Mount Auburn, Ohio, Smithville, Dodge City, Malone, Davenport (many); 13th, Lyndon, Ill., Waterburg, N. Y., Nashville, Malone, Davenport (numerous), Indianola; 14th, Lyndon, Ill., Vevay, Ind., Ellinwood, Kans.; 15th, Ellinwood, Kans., Waterburg, N. Y., Jacksonborough, Ohio, Hampton, Va. (numerous); 16th, Lyndon, Ill., Ellinwood, Kans., Woodstock, Md., Auburn, N. H., Wooster, Ohio, Smithville; 17th, New Harmony, Ind. (brilliant), Ellinwood, Kans., Woodstock, Md., Waterburg, N. Y., Davenport, Fort Gibson; 18th, Lyndon, Ill, Corning, Mo. (large, seen at 2 p. m. with sun shining brightly), Vineland, N. J.; 19th, Wooster, Ohio; 20th, New Harmony, Ind., Ephrata, Pa., Savannah, Saint Paul; 21st, Ellinwood, Kans., Woodstock, Md., Corning, Mo., North Volney, N. Y., Wooster, Ohio; 22d, Salem, W. Va., Davenport; 23d, Lyndon, Ill., Vineland, N. J., Smithville, Malone; 24th, Atlanta, Ga.; 25th, Harbor-Grace, Newfoundland, San Francisco; 26th, Ellinwood, Kans.; 27th, Hanover, Pa., Saint Paul; 28th, Waterburg, N. Y.; 29th, Lyndon, Ill. (very brilliant west to east), Ephrata, Pa.; 31st, New Orleans, La. (brilliant).

Polar bands.—1st, Hanover, Pa.; 2d, Newport; 10th, Breckenridge; 11th, Auburn, N. H., Hanover, Pa., Freehold, N. J.; 19th, Milwaukee; 20th, Detroit; 22d, Bennettstown, Ky., Norfolk; 24th, Hanover, Pa.; 31st, Duluth.

Earthquakes.—August 16th, 1.15 p. m., bark Forest Queen experienced a heavy earthquake shock of fifteen seconds' duration, in latitude 41° 55′ north, longitude 126° 25′ west; 16th, 11.25 p. m., shock seven seconds' duration, accompanied by a loud rolling noise for twenty seconds, vibration from northwest to southeast, at Lower Brulé Indian agency, Dak.

Icebergs.—August 3d, in latitude 42° 59′ north, longitude 49° 57′ west; 11th, in latitude 43° north, longitude 51° west; 12th, in latitude 48° 50′ north, longitude 49° 58′ west; 18th, in latitude 47° 15′ north, longitude 47° 30′ west, six large ones; 19th, between twenty and thirty large bergs, in latitude 47° 45′ north, longitude 48° 05′ west, largest from 100 to 200 feet high, drifting in a southwest direction; steamer Arbitrator, from New Orleans, 12th, for Liverpool, struck an iceberg and sunk in thirty minutes on 23d.

MISCELLANEOUS PHENOMENA.

Zoological.—Swans, at Keokuk, flying south 25th and 31st. *Wild Pigeons*, at Pembina, flying southwest 15th and 17th, northwest 25th, north 27th and 28th. *Wild Geese*, at Wautoma, Wis., flying southeast 13th; Breckenridge, south 24th; Fort Sully, south 30th; Pembina, north 14th, and southeast 31st. *Wild Ducks*, at Barnegat, flying south 20th. *Swallows* last seen at Cornish, Me., 18th; Breckenridge, Minn., 24th; West Charlotte, Vt., 28th. *Bobolinks* last seen at Cornish, Me., 21st; West Charlotte, Vt., 28th. *Night Hawk* last seen at Cornish, Me, 22d. *Cuckoo* and *Whippoor-will* last heard at Contoocookville, N. H., 16th and 17th respectively. *Robins*, large flocks flying west at Shreveport, La., 26th. *Colorado Beetle*, numerous at Mendon, Mass., 4th; appeared on the 1st at Strafford, Vt., but not much damage done; potato crop nearly destroyed by bugs at Albany, N. Y. *Grasshoppers*—Missouri: 6th, appeared at Lamar's, Nodaway County. Iowa: 6th, appeared at Storm Lake, Cherokee, and Sioux City, column extending to Lower Dakota and Lamar's, Mo., at Fonda, Pocahontas County, damage slight; 25th, at Unionville, Appanoose County, flying in large clouds at a high elevation, and Des Moines, Polk County, flying toward the Missouri in immense numbers; "none have yet alighted in Central Iowa." Minnesota: Breckenridge, swarms seen on 1st; very destructive 3d; flying and depositing eggs 6th to 12th; a small red bug, said to be devouring eggs, appeared, but the observer could not ascertain this to be a fact from careful observation; in the western counties, wheat, corn, oats, and barley have suffered severely. Kansas: 22d to 31st, Dodge City, numerous and very destructive, causing entire loss of crops in many sections; 24th, Ellinwood, came from north-northeast, 29th, southwest, 31st, northeast and west; Fort Wallace, flying southwest 19th, north 23d, settling 24th; 31st, Atlanta, came in large numbers, injured fall wheat, late corn, and gardens, also flying southeast. Nebraska: 5th, at North Platte, Lincoln County, entire corn-crop destroyed, and in Dawson County one-fourth of crop destroyed; came from Dawson County to Buffalo County; 10th, Clear Creek, flying southwest; 11th, northwest; arrived in immense numbers 18th, and remained rest of month; 11th, alighted in immense numbers at Fremont, Dodge County, and commenced on the corn, country near Elm Creek, Buffalo County, cleaned out, column moving in a northwest direction, not many miles

wide; 12th, very thick at Columbus, Platte County; came down the valley from North Platte, doing but little damage; at Grand Island, Hall County, loss small; 13th to 26th, at Omaha, numerous at times, flying in all directions; 18th to 31st, at De Soto; 23d, at Lincoln, Lancaster County, in vast numbers, but not so numerous as in 1874 passing south and southeast in clouds, corn considerably damaged; 24th to 31st, at Plattsmouth; 25th, in York County, have left nothing but harvested grain. Dakota: 6th, appeared in the extreme southeastern part of the State; 10th to 29th, at Fort Sully, numerous, decreased during 30th and 31st; at Yankton, numerous during early part of month, destroying all the corn; about 10th began to depart, and all gone in a few days; 26th, Bismarck, swarms flying southwest. Colorado: 2d, Denver, came from north in great numbers, very destructive; 3d, continued numerous until 11th, had all left by 13th, from 22d to 28th flying in air, but few alighting, diminished in number 29th to 31st; 3d, passed over Pueblo, going north, no damage; 5th, Golden, flying southeast about 6th to 13th, leaving 13th to 16th, returning from northwest 23d, and flying northwest 24th and 25th; 12th, near Denver, made a clean sweep of the mountain ranches, came in dense, thick clouds, but have mostly moved away; 31st, Fort Garland, air filled, flying with the wind. Wyoming: at Cheyenne, abundant from the 7th to 31st. Montana: millions flying SE. 1st to 5th, at Virginia City, decreased in numbers until 29th, no eggs deposited.

Forest fires.—5th, in New Brunswick; 8th to 12th, Carson City, Nev.; 16th, on Campobello Island, N. B.; 17th and 18th, Shelburne, N. H.; 22d to 31st, Auburn, N. H.; 24th to 31st, Blooming Grove, Pa.; 25th, North Hammond, N. Y.; 27th to 31st, Fishkili Mountains, N. Y.; 28th, in the mountains near Pond Eddy, Pa., vast amount of timber destroyed; around Honesdale, Pa., woods burning fiercely; in Clinton Township, Allegheny County, Pa., men fighting the fire; the Moosic Mountains, Luzerne County, Pa., ablaze for miles, a vast amount of timber destroyed, but one rain in this section since July 4th; in the mountains, Essex County, N. Y.; in the Highlands, opposite Newburg, and near West Point, immense surface burned over; 31st, Mount Desert, Me., raging in woods; Pike County, Pa., raging with great violence, valuable timber destroyed; Saint Lawrence County, N. Y., large quantities of timber, hay and grain destroyed, and some cattle burned; near Bounton, N. J., several thousand acres of bog meadows on fire for a number of days; near North Conway, N. H., large quantities of valuable timber destroyed in mountains.

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ALBERT J. MYER,
Brig. Gen. (Brevet Assigned), Chief Signal-Officer, U. S. A.

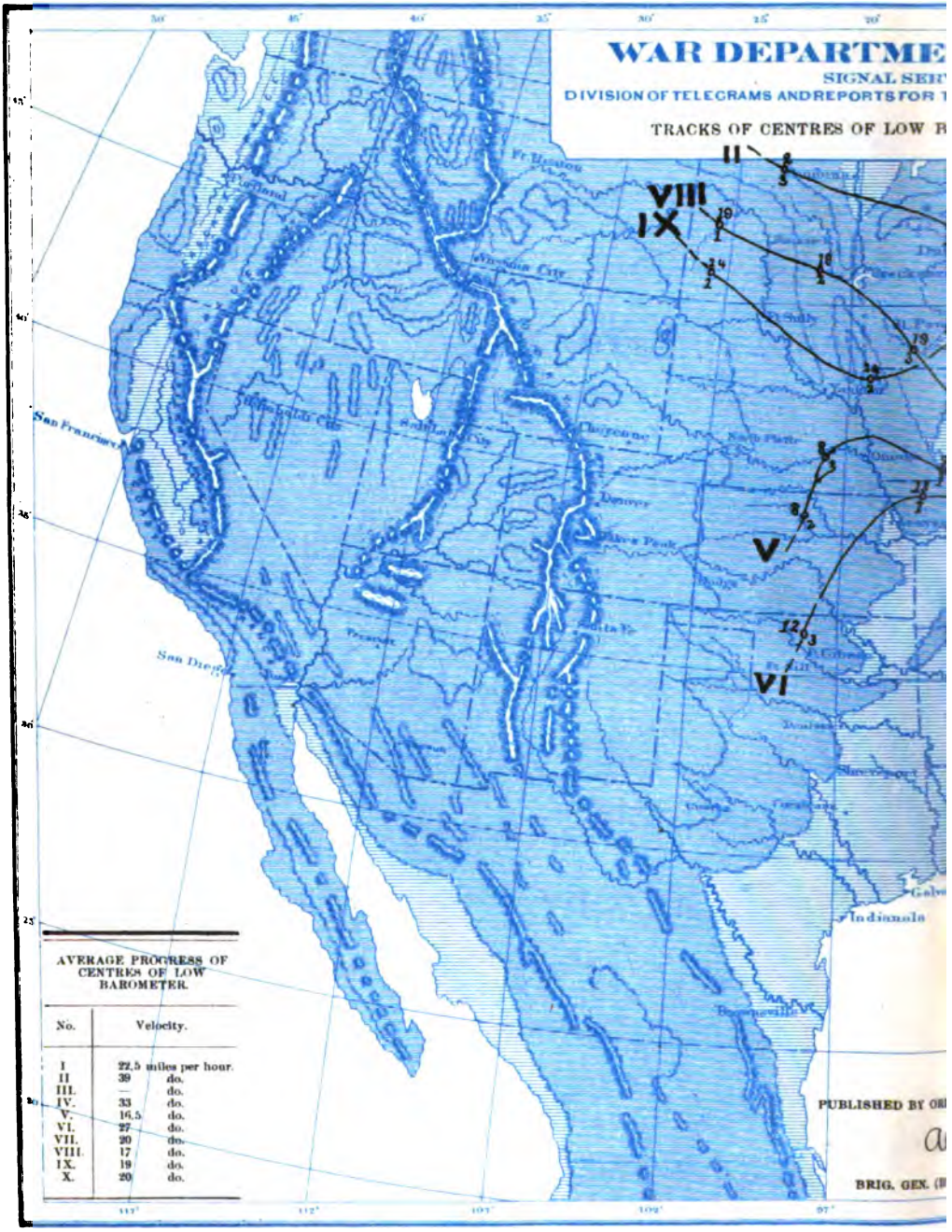
PAPER 28.

MONTHLY WEATHER REVIEW, SEPTEMBER, 1876.

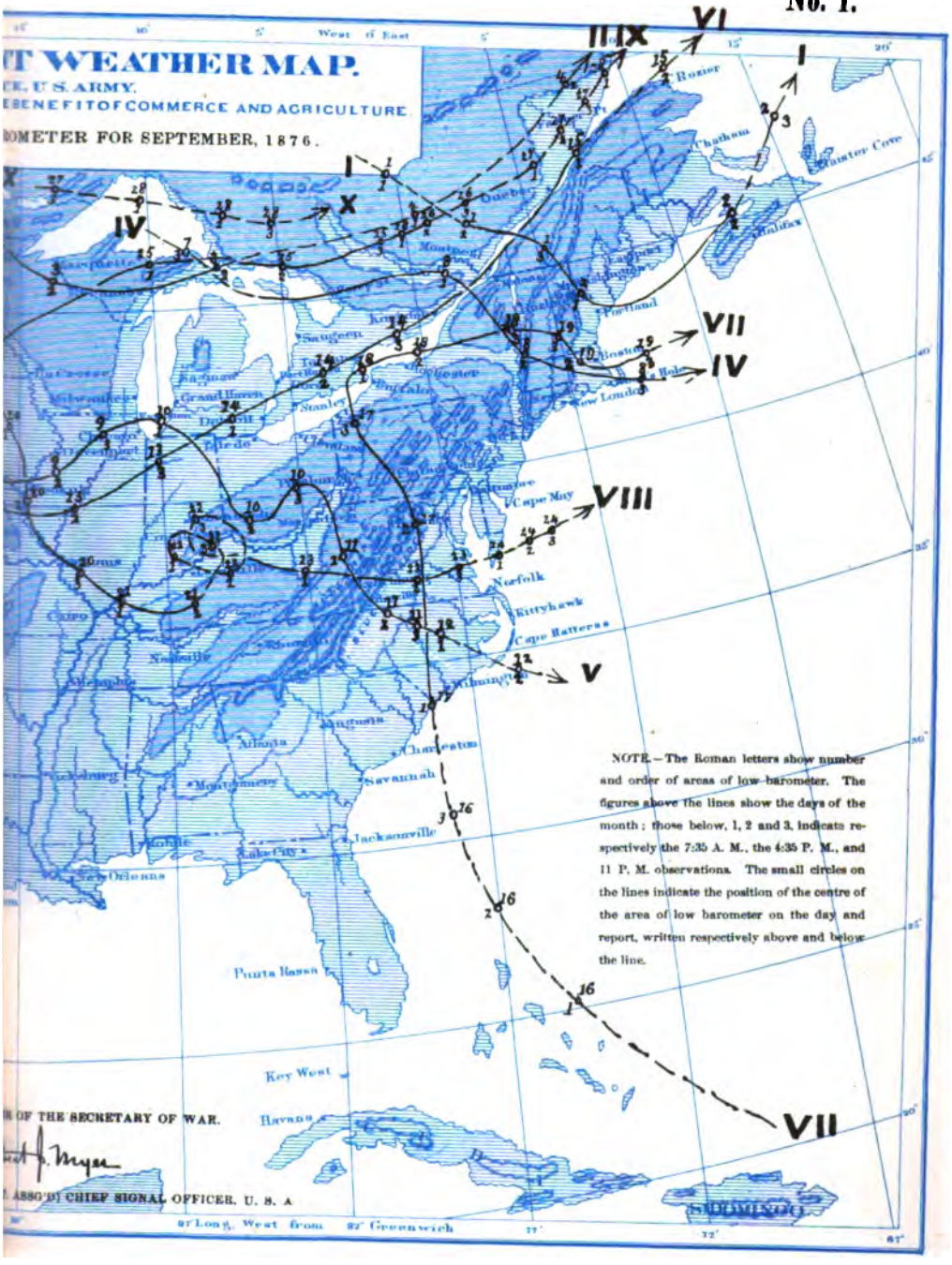
The present review is based on the meteorological data collected in the office of the Chief Signal-Officer of the Army. Especially have the regular tri-daily charts been consulted, and the monthly journals and reports from four hundred and eighteen stations, classified as voluntary observers, Army posts, and signal-service stations. The more prominent features in the meteorology of the month have been, first, the general prevalence of low pressures and low temperatures east of the Rocky Mountains: second, the unusual rain-fall of the Atlantic States; third, the destructive hurricane of the 16th and 17th.

BAROMETRIC PRESSURE.

In general.—The general distribution of barometric pressure is shown by the isobars upon Chart No. II, from which it will be seen that the average pressure is very uniform over the greater part of the region covered by the observations. In September, 1873, the isobar of 30.00 passed from Kansas to Lakes Erie and Ontario, and thence to the Gulf of Saint Lawrence, the pressure being higher on the south and east sides. In September, 1874, the same isobar lay decidedly north of the Lower Lakes and the Saint Lawrence, but curved southward through the Mississippi Valley to the Gulf of Mexico. In September, 1875, its position lay to the south of the Lower Lakes and the Saint Lawrence, and in the present month it is still further south and is almost entirely confined to the Gulf States, while the greater part of our territory shows an average pressure from 0.05 to 0.15 lower than in previous years. Perhaps the most remarkable features in this respect are the high pressure in and north of Minnesota, and the low pressure off the Middle Atlantic States, which conditions, if they continue, may herald an early and cold winter. As compared with the isobars of August, 1876, lower pressures are noted in Oregon and throughout the Atlantic States, but decidedly


WAR DEPARTME
SIGNAL SER
DIVISION OF TELEGRAMS AND REPORTS FOR
TRACKS OF CENTRES OF LOW B
II
VIII
IX
V
VI
San Francisco
San Diego
Cheyenne
Denver
Pikes Peak
Indianola
AVERAGE PROGRESS OF CENTRES OF LOW BAROMETER.
No. Velocity.
I 22.5 miles per hour.
II 39 do.
III. — do.
IV. 33 do.
V. 16.5 do.
VI. 27 do.
VII. 20 do.
VIII. 17 do.
IX. 19 do.
X. 20 do.
PUBLISHED BY OR
BRIG. GEN. (

No. I.


T WEATHER MAP.
CE, U. S. ARMY.
EBENEFIT OF COMMERCE AND AGRICULTURE.
OMETER FOR SEPTEMBER, 1876.
I
II
III
IV
V
VI
VII
VIII
IX
X
Roxier
Chatham
Quebec
Montreal
Portland
Boston
Cape May
Norfolk
Kittyhawk
Cape Hatteras
Charleston
Savannah
Jacksonville
Punta Rassa
Key West
Havana
NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:35 A. M., the 4:35 P. M., and 11 P. M. observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.
OF THE SECRETARY OF WAR.
ASSG'D CHIEF SIGNAL OFFICER, U. S. A.
87° Long. West from 82° Greenwich

higher pressures in Minnesota and Dakota, showing that the change from the summer to the winter distribution of the atmosphere is already well under way.

Areas of high barometer.—These areas have, during the past September, been marked at each successive recurrence by a steady increase in the temperature depression, in the area and volume of cool air, and in the distance to which they have penetrated southward before being dissipated by solar heat and increasing moisture. Thus, in the early part of the month, none of these were able to produce severe northerly winds on the Gulf coast, while the last one exhibited a somewhat unexpected power in this respect, as shown by the "northers" of September 29th and 30th.

No. I.—This is recorded as No. VII in the review for August. The course of the central area of highest pressure is very approximately given by its successive positions at 7.35 a. m., and was as follows: On the 1st, central in Dakota, the minimum temperature reported that morning from this region being 41°; on the 2d, central in Iowa, with a minimum of 35°; 3d, in Tennessee, minimum 56°, after which it disappeared over the Eastern Gulf and South Atlantic States.

No. II followed in the rear of low pressure No. II, and it was central on the successive mornings as follows: On the 4th, in Manitoba, minimum temperature 37°; 5th, Lakes Superior and Huron, minimum 39°; 6th, Maryland, minimum 43°, after which it flowed southward along the Carolina coasts.

No. III followed in the rear of low barometer No. IV. It was, on the morning of the 7th, central in or north of Manitoba, the minimum temperature reported being 44°; on the 8th, east of Manitoba, minimum 35°; 9th, north of Lake Superior, minimum 44°; 10th, north of Lake Superior, and the minimum 49°. By this time, also, a portion of the air had extended southward to the Texas coast, where the maximum wind was north 14 miles; 11th, central north of Wisconsin, with extensions to Texas and New England, and a minimum of 37°, and highest wind on Texas coast north 20 miles; 12th, north of Lake Superior, minimum 35°; 13th, north of Lakes Huron and Erie, minimum, 38°.

No. IV followed in the rear of low pressure No. VI. Central on the morning of the 14th, in Manitoba, minimum 35°; 15th, in Missouri, minimum 45°, and maximum wind on the Texas coast northeast 24 miles; 16th, north of Lake Erie, minimum 36°, with an extension to the Texas coast, maximum wind northeast 20 miles; 17th, in Maine, minimum 44°, while a hurricane was central on the North Carolina coast; 18th, in Cape Breton, minimum 38°, while the hurricane was central near Buffalo; 19th and 20th, over the Gulf of Saint Lawrence; 21st, over the Gulf of Saint Lawrence, minimum 36°; 22d, central in Maine, minimum 40°.

No. V followed low pressure No. VII, on its southwest side. On the 18th, central in Alabama, minimum 59°; 19th, Alabama, minimum 61°.

No. VI followed low pressure No. IX, and on the 25th was central in Dakota, minimum 35°; 26th, Dakota, minimum 30°; while the lowest pressure was in the Saint Lawrence Valley, and the maximum wind on the Texas coast, north 15 miles; 27th, in Missouri, minimum 43°, the low pressure being central in the Saint Lawrence Valley, and the wind on the Texas coast north 14 miles. On the 28th, high pressure extended from Arkansas to North Carolina, minimum 41°, the wind on the Texas coast northeast 16 miles, with the extensive area of low barometer, No. IX, in the Saint Lawrence Valley. On the 29th, near the Missouri Valley, minimum 33°, while the low pressure over the Middle and Eastern States became central in the Saint Lawrence Valley, and the winds on the Texas coast were north 15 miles. On the 30th, central in Dakota, minimum 19°, and wind on the Texas coast north 32 miles.

Areas of low barometer.—During September eight areas of low barometer have been well developed. Five have passed along the northern limit of the signal stations; two have passed from Texas northeastward; the hurricane of the 12th to 18th passed from the Windward Islands east-northeast to the Bahamas, turning to the northeastward near the Georgia coast, and again northward over North Carolina to Washington, thence north-northwest to Buffalo; thence as a slight disturbance eastward to the Atlantic.

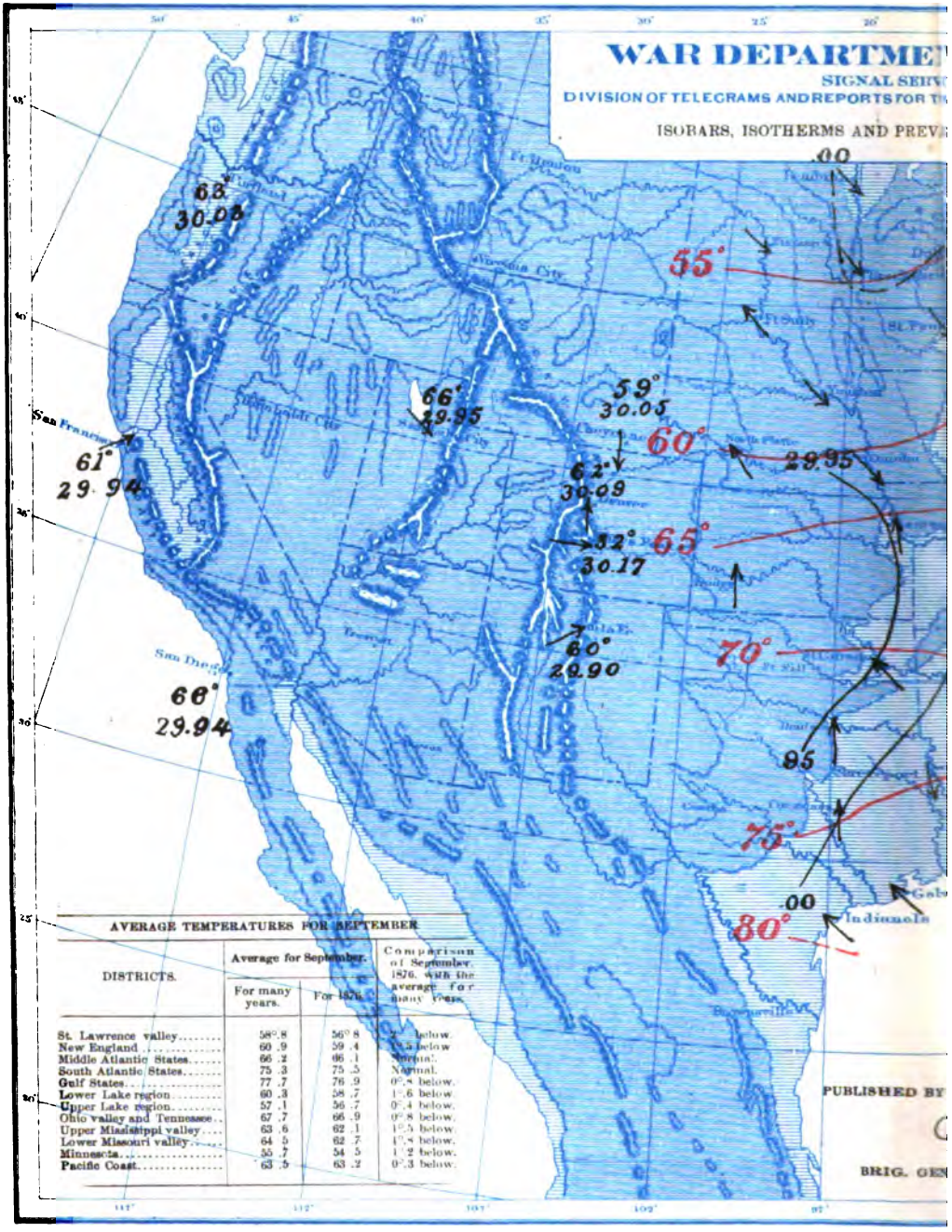
No. I.—The morning map of the 1st shows a depression moving southeastward over Canada. After extending as a trough from Pennsylvania to Vermont, it then passed northeast to the Gulf of Saint Lawrence. The central low barometer seems to have rapidly fallen from 29.70 on the 1st, at 4.35 p. m., to 29.20 on the afternoon of the 2d. Considerable rain fell in the Middle and Eastern States, and the highest winds were on the 2d, 7.35 a. m., Cape May, northwest 36; Sandy Hook, northwest 30; at 4.35 p. m., Cape May, northwest 40; Sandy Hook, northwest 36; Kitty Hawk, north 30.

No. II.—The areas of high pressure, No. 1, having pushed the warmer air of the Mississippi Valley west and northward, there were reported on the 2d, at 4.35 p. m., cloud and rain in Nebraska, Kansas, and Colorado, while in Manitoba appeared to be the central region of low pressure, which, during the next twenty-four hours, moved eastward over Lake Superior, but extended as a trough southwestward to Nebraska. Preserving its long-oval shape, it moved eastward over the Lower Lakes, and was, on the 4th, in the afternoon, central near the mouth of the Saint Lawrence. High winds were not reported in connection with this depression.

Nos. III, IV, and V.—On the southwest side of high barometer No. II, the cold easterly winds produced cloudy weather and numerous light rains on the afternoon of the 4th, as they ascended toward the crest of the Rocky Mountains; at 11 p. m. warm southerly winds prevailed in Kansas and Nebraska, and the cold northwest winds of Colorado were attended with cloud and rain, and the barometric depression appears central near the border of these three States. During the 5th and 6th the barometer fell in all directions from this central region; but the area of greatest depression seems not to have moved any considerable distance, nor can its path be satisfactorily plotted until the afternoon of the 8th, at which time the pressure had began to rise decidedly on the north and west sides of the depression, which is now numbered V, and whose subsequent track is given on Chart No. I. Its course was approximately eastward, and was traversed quite slowly. The attending area of cloud and rain was quite extensive, covering, on the afternoon of the 10th, the northwest, the Lake region, the Mississippi and Ohio Valleys, and the Atlantic States. Owing to the extensive area of high pressure in British America, the winds on the Lakes continued pretty steady north and northeast from the 7th to the 12th; no steep gradients and but few brisk winds were reported up to the time the depression left the North Carolina coast. The phenomena observed from the 3d to the 8th in Colorado, Kansas, and Nebraska were about as follows: Southerly winds extended from the Texas coast northward into Kansas, with maximum temperatures of 95° to 98° during those days, and clear or partly cloudy, dry weather; northerly winds, with maximum temperatures steadily diminishing in Nebraska from 85° on the 5th to 58° on the 8th. Cloudy and rainy weather prevailed from Nebraska northward to the British Possessions. Central and Northern Kansas appears to have been the region of neutral ground between these conditions, and the observer at Great Bend states that, on each afternoon, from the 5th to the 8th, the wind gradually veered from the south to the northwest or north, and (probably on the latter date) to the northeast; on each day, also, a long line of cloud, extending from south of west to east, gathered to the south of the station, from which thunder-showers and slight whirlwinds or tornadoes started out, moving to the eastward at the rate of about 45 miles per hour. After the 4.35 p. m. report of the 8th, the weather-charts show that the cold air accumulating to the northward flowed in a steady current over Western Kansas, while the area of low pressure moved eastward. The opposition of northerly and southerly winds in the Missouri Valley was but one feature in the advance southeastward of a great area of cold air in British America. The region from Kansas, northward, to Lake Huron into Canada, constituted, on the afternoon of the 7th, a barometric trough, the northern end of which became separated the morning of the 8th from the southern end by the intrusion of northwest winds over the Lake region, and which subsequently moved eastward as an oval area of low barometer, whose track is given as No. IV upon Chart No. I. Its movement was far more rapid than that of No. V, and no high winds were reported in connection with it at the stations; but the maps from 11 p. m. of the 9th to 11 p. m. of the 10th seem to indicate the passage of a storm-center northeastward past Cape Breton, which may possibly have been the subsequent course of No. IV. The observer at Harbor Grace, Newfoundland, reports a severe gale on the 10th. The first indications of its approach was noted by him on the 9th at 4.35 p. m., at which time storm No. IV must have been central in longitude 60°, latitude 43°. Rain began at Harbor Grace on the 9th at 7 p. m., with increasing northeast winds, which continued during the night without veering, and during Sunday, the 10th, with occasional heavy squalls; the aneroid barometer had fallen 0.7 inches. Hurricanes were experienced on the 10th, in this neighborhood, by ocean steamers. During Monday, the 11th, the wind backed to strong northwest breezes.

No. VI.—Warm southerly winds prevailed for a short time on the 12th, from Texas to Missouri, while cold northerly winds, cloud and rain extended northward, with rising barometer, into British America. The lowest pressure on the 12th, at 11 p. m., was about 29.95 in Indian Territory, with high, cold, northerly winds to the westward. This area of relatively low pressure moving northeastward, rapidly developed on the 13th and 14th into a well-marked storm-center, within which the lowest pressure was 29.70. This depression passed over the Lakes and Saint Lawrence Valley on the 15th, accompanied by extensive light rains and no high winds; the isobars during the 14th and 15th included a narrow oval pointing nearly NE.

No. VII.—This hurricane struck the coast of North Carolina, near Wilmington, early on the morning of Sunday, the 17th, but its presence had been perceptible so early as 4.35 p. m. of the 15th, when the Synopsis announced "indications of a severe disturbance to the east of Florida," after which date its movements were regularly predicted in the Probabilities, and the approach of severe winds forewarned by signals. As its center passed directly over Washington between 4 and 6 o'clock of the afternoon of the 17th, the accompanying copy of the records of self-registering instruments will be interesting. A peculiar interest attaches to this hurricane, inasmuch as it is one of the few that, after approaching the Atlantic coast, has been deflected to the northwest instead of to the northeast—a deflection which was partially anticipated, and is appar



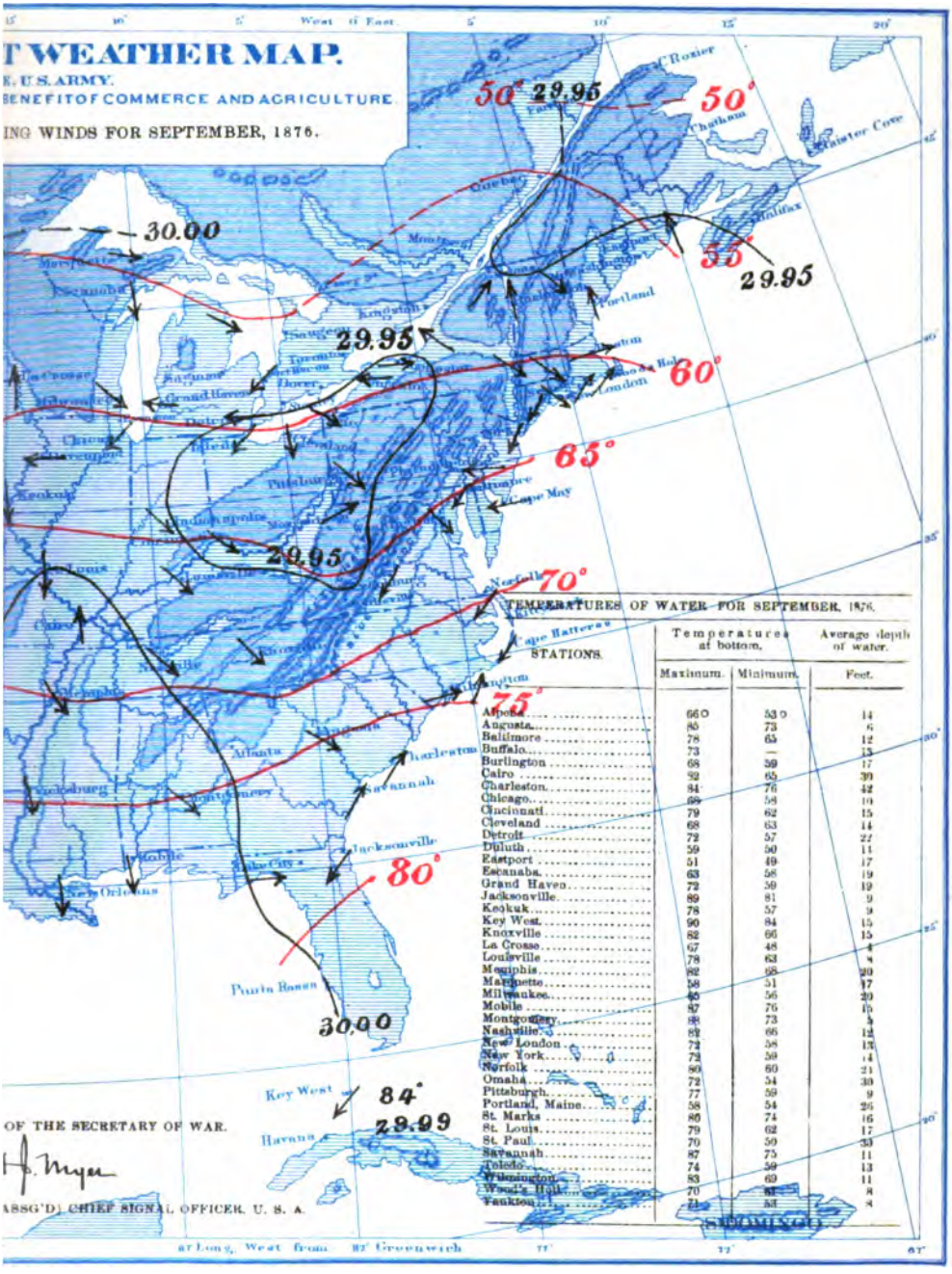
AVERAGE TEMPERATURES FOR SEPTEMBER.

DISTRICTS.	Average for September. For many years.	Average for September. For 1876.	Comparison of September, 1876, with the average for many years.
St. Lawrence valley	58°.8	56°.8	2° below.
New England	60 .9	59 .4	1°.5 below.
Middle Atlantic States	66 .2	66 .1	Normal.
South Atlantic States	75 .3	75 .5	Normal.
Gulf States	77 .7	76 .9	0°.8 below.
Lower Lake region	60 .3	58 .7	1°.6 below.
Upper Lake region	57 .1	56 .7	0°.4 below.
Ohio valley and Tennessee	67 .7	66 .9	0°.8 below.
Upper Mississippi valley	63 .6	62 .1	1°.5 below.
Lower Missouri valley	64 .5	62 .7	1°.8 below.
Minnesota	55 .7	54 .5	1°.2 below.
Pacific Coast	63 .5	63 .2	0°.3 below.

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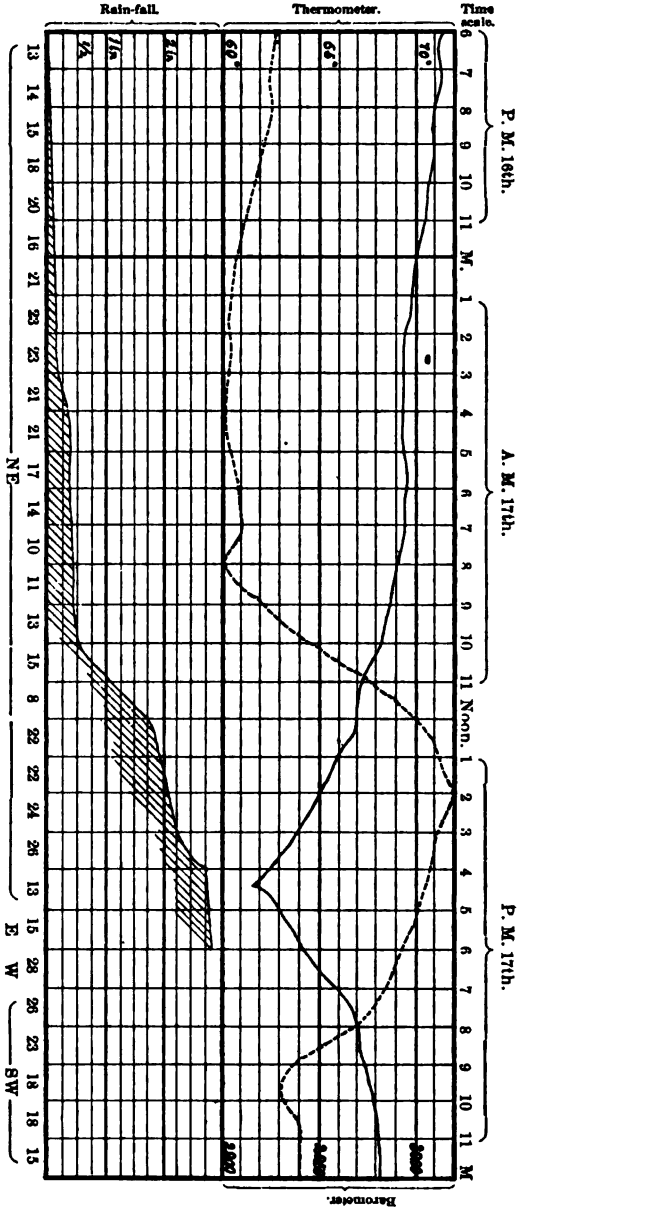
No. II.



TEMPERATURES OF WATER FOR SEPTEMBER, 1876.

STATIONS.	Temperature at bottom.		Average depth of water.
	Maximum.	Minimum.	Feet.
Alpena	66	53	14
Augusta	80	73	6
Baltimore	78	65	12
Buffalo	73	—	15
Burlington	68	59	17
Cairo	92	65	39
Charleston	84	76	42
Chicago	68	58	10
Cincinnati	79	62	15
Cleveland	68	63	14
Detroit	72	57	22
Duluth	59	50	11
Eastport	51	49	17
Escanaba	63	58	19
Grand Haven	72	59	19
Jacksonville	89	81	9
Keokuk	78	57	9
Key West	90	84	15
Knoxville	82	66	15
La Crosse	67	48	4
Louisville	78	63	8
Memphis	82	68	20
Marquette	58	51	17
Milwaukee	68	56	20
Mobile	87	76	10
Montgomery	88	73	5
Nashville	82	66	12
New London	72	58	13
New York	73	59	14
Norfolk	80	60	21
Omaha	72	54	30
Pittsburgh	77	59	9
Portland, Maine	58	54	26
St. Marks	86	74	16
St. Louis	79	62	17
St. Paul	70	50	33
Savannah	87	75	11
Toledo	74	59	13
Wilmington	83	69	11
Wood's Hall	70	52	8
Yankton	71	53	8

ently accounted for by the presence of the area of decidedly high pressure north of the Alleghanies on the 17th, and the consequent heavy rains over the Middle States and Lower Lakes, with northeast winds. After remaininng early stationary in Western Pennsylvania and New York from 11 p. m. of the 17th to 7.35 a. m. of the 18.h, the center moved slowly eastward, and appears, so far as the land stations are concerned, to have degenerated into an area of less intense wind, rain, and barometric depression; nor have any reports come to hand indicating its progress eastward over the North Atlantic beyond the course given on chart No. I. Its earlier history, so far as at present known, is as follows: Earlier than the 12th, there is little or no information, but that the hurricane must have existed some time previous to that date is evident, not only from general considerations, but also from the following note: The British brig Mary M. Williams, Captain Hanna, from New York for Bahia, was spoken on the 12th, latitude 25° north, longitude 43° west, after having been damaged in a hurricane. On the 12th the hurricane-center approached the Windward Islands from the southeast or east-southeast, being first felt at Antigua; the lowest barometer, 29.35, occurred at St. Kitt's on the 12th, at 8.30 p. m., and at St. Thomas, 29.45, on the 13th, 4.30 a. m., up to which time the wind had remained steady from the northeast, with increasing force. At Porto Rico (San Juan), the lowest pressure was 29.49, on the 13th, at 8.30 a. m., the wind veering from north-northeast, on the morning of the 12th, to northeast, and subsequently, at 9 a. m. of the 13th, to east. The destruction of crops and buildings is reported to have been very great at these islands. On the 14th a light hurricane is reported from Santiago de Cuba, and on the 15th on the Bahama Banks; it therefore evidently passed somewhat more slowly in this portion of its course than is indicated by the first rough sketch of its track as given in Chart No. I, and if the newspaper accounts that have been received are reliable, according to which the hurricane-wind, both at Santiago de Cuba and the Bahamas, veered from northeast to southeast, it must be considered that the track of the center lay farther westward than that here given. In its passage along the South Atlantic coast, and especially on the 16th, 17th, and 18th, very heavy easterly gales prevailed from Cape Hatteras to Cape Cod. The schooner Addie Fuller, Captain James Jorgenson, from Brunswick, Ga., to Boston, encountered the storm while north of Cape Hatteras, and, as her barometer has been well compared and reliable,



it is worth noting that the lowest pressure recorded was 29.40, about 2 p. m. of the 17th, with a southerly gale of force 8, on a scale of 10. The position of the schooner was probably 100 miles east of the track of the center of the hurricane. The southwest and northwest winds that succeeded the hurricane were less violent and of shorter duration at stations in Virginia than in North Carolina. The anemometers at Wilmington and Cape Lookout were disabled at the height of the storm, after recording, respectively, north 60 and southwest 73 miles. Other records of high velocities are as follows: The observer at Hampton, Va., reports lowest barometer (29.10 reduced to Signal-Service standard) occurred at 1.20 p. m. of the 17th, the wind veering from northeast to southeast, and by 4 p. m. to south; at Washington, D. C., the records of the central office show that the lowest barometer was 29.15 about 4.35 p. m., during a period of calm which lasted from 4.50 to 5.50 p. m., after which the wind, which had been steady from the east, shifted to the west; the maximum wind velocity was west 36 miles. The lowest pressures were: Smithville, 29.24; Wilmington, 29.32; Cape Lookout, 29.46.

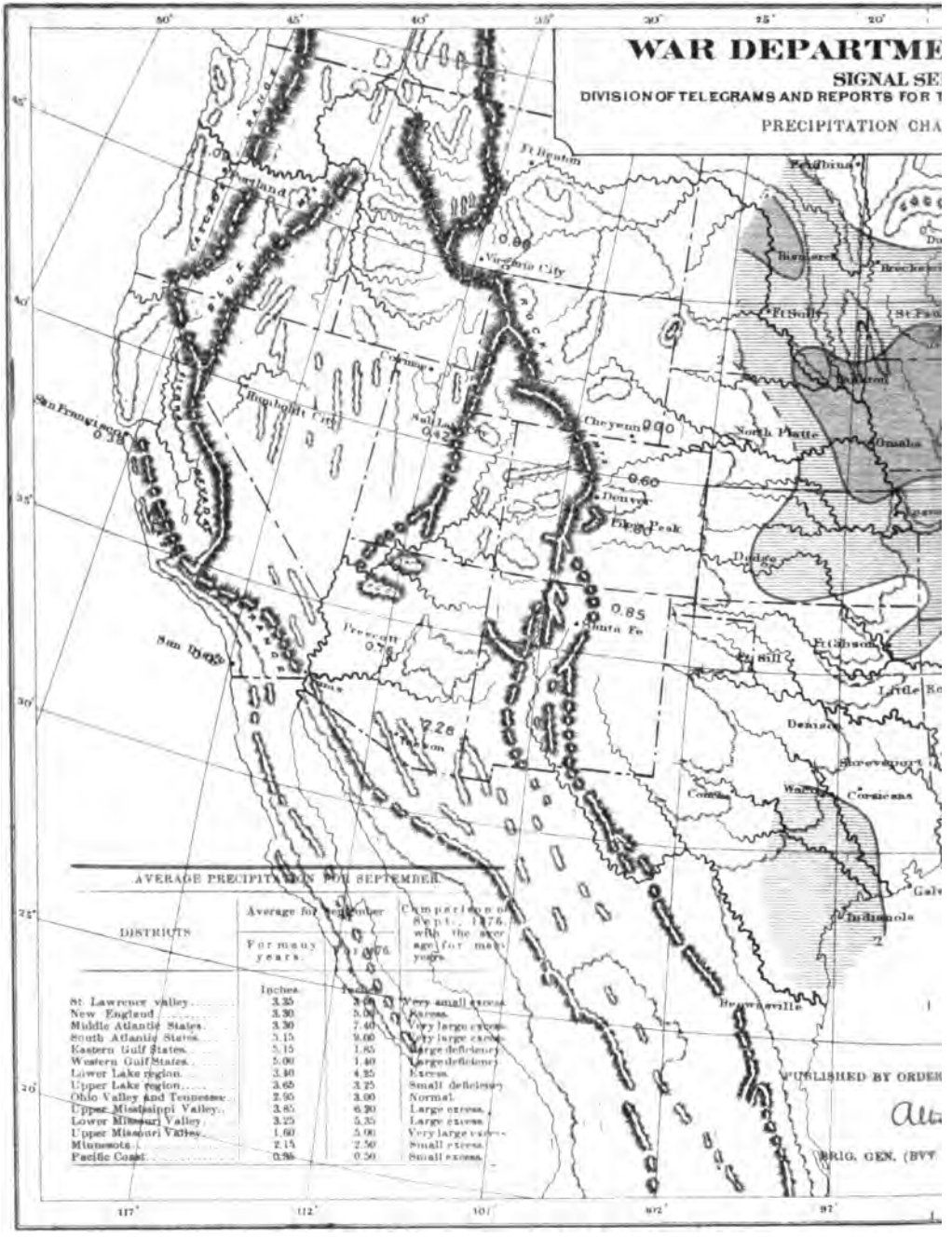
No. VIII.—While No. VII was passing northward over the Middle States on the 17th, an area of high pressure was apparently advancing southward, reaching Oregon on the 18th, and the barometer was low at the Rocky Mountain stations, and from Texas to Manitoba. The oval area of lowest pressure was on the afternoon of the 19th on the eastern border of Dakota, whence it extended slowly southeastward to Southern Illinois on the 20th at 11 p. m.; while remaining nearly stationary there and in Tennessee and Kentucky during the 21st and 22d, it extended westward, but eventually on the 23d was divided into two ill-defined portions, of which the western one vanished, while the eastern one moved slowly eastward and disappeared off the Middle Atlantic coast on the 24th. Northeast winds, cloud, and rain prevailed over the Lower Lakes, Middle Atlantic States, and Upper Ohio Valley during the greater part of the time from the 20th to the 24th. Wind velocities exceeding 25 miles were rarely reported, and were essentially local in their severity.

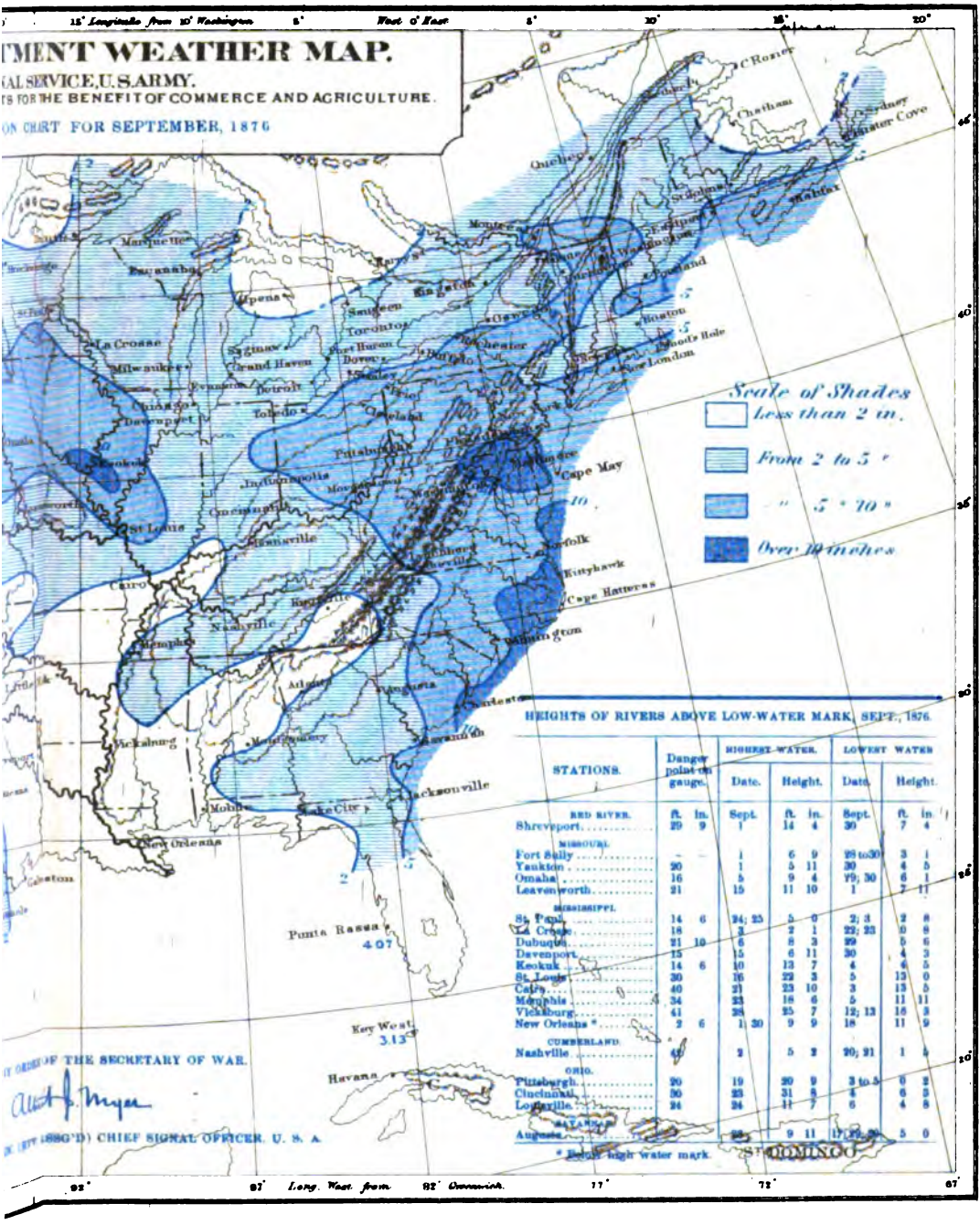
Nos. IX and X.—Low pressure No. IX was preceded by a decided fall in the barometer in Manitoba and Dakota, where its origin may apparently be placed. At 4.35 p. m. of the 24th, it was central in Iowa, and at 11 p. m extended as a trough from Indian Territory to Lake Superior. After this date the northern extremity of the trough moved eastward over the Saint Lawrence Valley, and by 7.35 a. m. of the 16th, the central depression had fallen to 29.50, with a larger area of cloud and rain, which increased still more during the day, and was especially persistent over the Lower Lake region, where rain continued until the 27th, while the central lowest pressure remained almost stationary in the Saint Lawrence Valley. Brisk and high southwest and northwest winds were reported on the 26th and 27th from the Middle Atlantic coast and the Lower Lakes. At 7.35 a. m. of the 27th, the progress of depression No. X begins to be apparent in Manitoba, whence it moved east-southeastward over Lake Superior, and was, on the afternoon of the 28th, north of Lake Huron, while No. IX was probably over the Gulf of Saint Lawrence. The very slow progress of No. X at this point was accompanied by continued rain and brisk or high southwest winds until noon of the 29th over the Lower Lakes. The map of the 29th, 4.35 p. m., shows that at that time a very large area of low pressure must have existed in British America on the south and east of James' Bay, the southern end of which extended southward until, on the morning of the 30th, the barometer was below 30.00 everywhere east of Lake Superior, Indiana, and Georgia. This extended depression was accompanied by the formation of a large area of high barometer between the Mississippi and the Rocky Mountains.

TEMPERATURE OF THE AIR.

The general distribution of the temperature of the air is shown by the isotherms on Chart No. II, from which it will appear that normal temperatures have been reported from the Middle and South Atlantic States, but that everywhere else the average is low, and especially so from New England and the Saint Lawrence Valley westward to the Missouri Valley. These low temperatures may be especially attributed to the prevalence of cloudy and rainy weather, except in Minnesota, where northerly winds and higher pressures have prevailed somewhat more than usual.

Maximum and minimum temperatures have been as follows: *At northern stations:* Eastport, 69°, 44°; Portland, Me., 84°, 45°; Burlington, 84°, 39°; Malone, 82°, 43°; Albany, 90°, 44°; Oswego, 78°, 44°; Rochester, 78°, 40°; Buffalo, 75°, 43°; Erie, 77°, 45°; Cleveland, 78°, 40°; Toledo, 76°, 41°; Detroit, 77°, 39°; Port Huron, 75°, 38°; Alpena, 70°, 36°; Grand Haven, 76°, 42°; Chicago, 78°, 37°; Milwaukee, 77°, 32°; Escanaba, 74°, 36°; Marquette, 76°, 36°; Duluth, 75°, 34°; Saint Paul, 76°, 36°; Yankton, 82°, 26°; Fort Sully, 86°, 25°; Breckenridge, 76°, 24°; Bismarck, 78°, 10°; Pembina, 75°, 27°; Virginia City, 78°, 31°; Portland, Oreg., 90°, 44°. *At southern stations:* Key West, 93°, 77°; Jacksonvile, 97°, 56°; Savannah, 96°, 55°; Saint Marks, 93°, 59°; Montgomery, 95°, 52°; Mobile, 92°, 55°; New Orleans, 91°, 69°; Vicksburg, 94°, 52°; Shreveport, 95°, 52°; Corsicana, 99°, 51°; Galveston, 94°, 62°; Indianola, 93°, 67°;


WAR DEPARTME
SIGNAL SE
DIVISION OF TELEGRAMS AND REPORTS FOR T
PRECIPITATION CHA
Virginia City
Cheyenne
Denver
Pike's Peak
Santa Fe
Prescott
Tucson
San Francisco
Fort Yuma
Fort Buford
Fort Sully
Omaha
Dodge
Fort Gibson
Fort Hill
Shreveport
Corsicana
Indianola
Brownsville
AVERAGE PRECIPITATION FOR SEPTEMBER.
DISTRICTS
Average for September. For many years.
Inches.
St. Lawrence valley 3.35
New England 3.30
Middle Atlantic States 3.30
South Atlantic States 5.15
Eastern Gulf States 5.15
Western Gulf States 5.00
Lower Lake region 3.40
Upper Lake region 3.65
Ohio Valley and Tennessee 2.95
Upper Mississippi Valley 3.85
Lower Missouri Valley 3.25
Upper Missouri Valley 1.60
Minnesota 2.15
Pacific Coast 0.80
Comparison of Sept., 1876, with the average for many years.
Inches.
Very small excess.
Excess.
Very large excess.
Very large excess.
Large deficiency.
Large deficiency.
Excess.
Small deficiency.
Normal.
Large excess.
Large excess.
Very large excess.
Small excess.
Small excess.
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HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, SEPT., 1876.

STATIONS.	Danger point on gauge.		HIGHEST WATER.			LOWEST WATER.		
			Date.	Height.		Date.	Height.	
RED RIVER.	ft.	in.	Sept.	ft.	in.	Sept.	ft.	in.
Shreveport	29	9	1	14	4	30	7	4
MISSOURI.								
Fort Sully	–	–	1	6	9	28 to 30	3	1
Yankton	20		1	5	11	30	4	5
Omaha	16		5	9	4	29; 30	6	1
Leavenworth	21		15	11	10	1	7	11
MISSISSIPPI.								
St. Paul	14	6	24; 25	5	0	2; 3	2	8
La Crosse	18		3	2	1	22; 23	0	8
Dubuque	21	10	6	8	3	29	5	6
Davenport	15		15	6	11	30	4	3
Keokuk	14	6	10	13	7	4	6	5
St. Louis	30		16	22	3	5	13	0
Cairo	40		21	23	10	3	13	5
Memphis	34		23	18	6	5	11	11
Vicksburg	41		28	25	7	12; 13	16	3
New Orleans *	2	6	1; 30	9	9	18	11	9
CUMBERLAND.								
Nashville	40		2	5	2	20; 21	1	4
OHIO.								
Pittsburgh	20		19	20	9	3 to 5	0	2
Cincinnati	50		23	31	5	4	6	3
Louisville	34		24	11	7	6	4	8
SAVANNAH.								
Augusta	28		9	11	17; 18; 20		5	0

* Below high water mark.

ER ORDER OF THE SECRETARY OF WAR.

Albert J. Myer

BVT. MAJ. GEN'L U.S.A.) CHIEF SIGNAL OFFICER, U. S. A.

Fort Yuma, 107°, 67°; San Diego, 82°, 54; Baton Rouge, 102° on the 26th; the Army surgeon states that this is the highest temperature of the year. *At high stations:* Mount Washington, 58°, 21; Cheyenne, 86, 27°; Denver, 90°, 32°; Pike's Peak, 51°, 6°; Santa Fé, 82°, 38°.

Ranges of temperature.—The largest ranges of temperature for the month have occurred at the following stations: North Platte, 73°: Bismarck, 68°; Dodge City, 65°; Fort Sully, 61°; Cheyenne, 59°; Denver, 58°; Yankton, 56°; Fort Gibson, 55°; Breckenridge, 52°; Cairo, 50°. The smallest ranges are noted as follows: Key West, 16°; Eastport, 25°; Indianola, 26°; Cape Hatteras and Wood's Holl, 27°.

Frost and *ice* have been reported as follows: On the 2d, in Iowa, Minnesota, Wisconsin; 3d and 5th, New York; 6th, New York, Massachusetts, Connecticut, Pennsylvania, Utah; 10th, Iowa, Maine; 11th, Maine; 13th, Maine, New York; 14th, Mississippi; 15th, Michigan, Minnesota; 16th, Illinois, Michigan, New York, Ohio; 19th, Wyoming Territory; 21st, Dakota Territory; 22d, Virginia, Maine; 23d and 25th, Wisconsin; 26th, Wisconsin, Indiana, Missouri, Minnesota; 27th, Massachusetts, Michigan, Iowa, Wisconsin, Indiana, Ohio, North Carolina; 28th, Virginia, West Virginia, Wisconsin, Maryland, North Carolina, South Carolina; 29th, Wisconsin, Iowa, Kansas, Nebraska, Dakota Territory, South Carolina; 30th, Wisconsin, Iowa, Kansas, Missouri, Nebraska, Minnesota, Tennessee, Arkansas, Colorado, Dakota Territory, Ohio, Indiana.

PRECIPITATION.

The general distribution of rain and melted snow is shown upon Chart No. III, from which it will be seen that the areas of largest precipitation have included the greater part of the Lower Lake region and Atlantic States, as also a portion of the Northwest. The excess in the Atlantic States fell to a large degree during the passage of the hurricane No. VII of the 16th and 17th; that in the Lower Lake region fell as long-continued light rains from the 22d to the 30th, and as heavy rains on the 17th and 18th; that in the Northwest fell, especially during the 5th to 9th, during the formation of low pressure No. V. Deficiencies of rain-fall are reported from the Eastern and Western Gulf States, in which regions the rain-fall has been less than 2 inches as compared with an average of 5 inches. In the same States during September, 1875, a very large excess was reported; but during September, 1873, a slight excess was reported, especially near the coast, and in September, 1874, an excess in the Western Gulf, but a deficiency in the Eastern Gulf States. On comparing Chart No. III with similar ones for 1873 and 1874, a slight similarity is noticed in the distribution of the rain, in that the regions of greatest fall are along the Atlantic coast and in the Southwest and Northwest, with regions of light rain-fall between.

Largest monthly rain-falls.—The following stations report large total rain-falls: Cape Henry, Va., 14.90 inches; Capeville, Va., 10.70; Mount Washington, N. H., 14.89; Cape Lookout, N. C., 14.09; Kittyhawk, N. C., 13.79; Goldsborough, N. C., 12.62; Cape Hatteras, N. C., 11.69; Charleston, S. C., 11.26; Washington, D. C., 10.81; Baltimore, Md., 10.52; Fallston, Md., 12.95; New Market, Md., 10.64; Dover, Del., 12.46; West Chester, Pa., 12.33; Tarantum, Pa., 12.00; Carlisle, Pa., 11.34; Keokuk, Iowa, 11.08.

Smallest monthly rain-falls.—Stations reporting less than four-tenths of an inch are the following: Cheyenne, Wyo., Yuma and Stanwix, Ariz., and Campo, Cal., 0.00 inch; San Diego, Cal., 0.03; Cambridge, Tex., 0.05; San José, Cal., 0.10; Fort Wallace, Kans., 0.15; Murphy, N. C., 0.20; New Orleans, La., and Florence, Ariz., 0.26; Brookhaven, Miss., 0.28; South Puebla, Colo., 0.31; Alpena, Mich., 0.36; Mesquite, Tex., 0.37; San Francisco, Cal., 0.38.

Heavy rain-storms.—Heavy rains are reported as follows: On the 1st, in Pike County, Pennsylvania, and at Port Jervis, N. Y., extinguishing the forest fires reported in last review; 1st, heavy rain-storm at Saint Louis; 5th, at Keytesville, Chariton County, Missouri, accompanied by hail and high winds; 6th, at Dubuque, Iowa, with thunder and lightning; 8th, at Des Moines and Dubuque, Iowa.

Snow-fall.—The first snow of the season is reported on the 27th at Tivoli, N. Y., and on the 28th seen lying on the summit of the Catskill. A few flakes of snow fell at McMinnville, Tenn., on the 30th; Marquette, 29th; Mount Washington, 9th, 26th, 27th; Pike's Peak, 4th, 15th, 16th, 17th, 18th, 27th, 28th; on Baldy Mountains, 15 miles from Santa Fé, 19th, 24th.

Hail on the 1st, 18th, 29th at Fort Union, N. Mex.; 2d, Quitman, Ga.; 3d, Fort Bridger, Wyo., and Virginia City, Mont.; 6th, Fort Hartsuff and North Platte, Nebr.; 8th, De Soto, Nebr.; 15th, Spartanburg, S. C., "stones varying in size from that of a cherry to a goose egg;" 18th and 27th, Genoa, Nebr.; 23d, Independence, Iowa; 27th, Fall River, Mass., and Madison Barracks, N. Y.; 29th, Fort Niagara, N. Y.; 30th, Purdy, Tenn.; 29th and 30th, Cleveland and Davenport; 26th, Detroit and Escanaba; Pike's Peak, 1st, 16th, 17th, 26th, 27th, 28th.

Cloudy days.—The number of days on which the cloudiness has equaled 8 on a scale of 10, as reported by voluntary observers, averages as follows: South Atlantic States,

2 to 7; Middle States, 14; New England, 8 to 18; Lower Lakes, 15; Upper Lakes, 12; Ohio Valley, 9 to 19; Northwest, 5 to 12; Southwest, 1 to 3.

Rainy days.—The number of days in which rain fell, as recorded at Signal Service stations, is: South Atlantic States, 7 to 12; Middle Atlantic States, 14 to 17; East Atlantic States, 11 to 15; Lower Lakes, 19 to 21; Upper Lakes, 10 to 16; Upper Mississippi Valley, 12 to 16; Lower Missouri Valley, 9 to 13; Southwest, 3 to 6.

Droughts.—The drought that prevailed in New England and the greater part of the Middle States during August ended with the rains of the first week in September. The deficiency in the Southwest is not generally reported as assuming the severity of a drought; a scarcity of water is reported from Corsicana.

Floods or freshets—probably due to local rains, although not always so stated by the observer. On the 8th, at Des Moines, Iowa; 9th, in vicinity of Dubuque, Iowa; 18th, in vicinity of Pittsburgh; 19th, in Nodaway River, Eastern Missouri; 21st, Forest County, Pennsylvania; 24th, in the Pedee River, at Albemarle, N. C.; on the 25th, at Weldon, N. C., the Roanoke River was high.

RELATIVE HUMIDITY.

The mean relative humidity for the month, as reported from the Signal Service stations, ranges in New England from 69 to 75 per cent.; Middle Atlantic States, 68 to 78; South Atlantic States, 70 to 78; Gulf States (excepting Florida), Tennessee, Arkansas, and Indian Territory, 59 to 70; Lake region, 71 to 78; Ohio Valley and Northwest, 66 to 76; Pacific coast, 71 to 77. It is, as usual, lowest at the Rocky Mountain stations, being 66 at Pike's Peak, 56 at Santa Fé, 41 at Denver and Virginia City, 40 at Cheyenne, and 30 at Salt Lake City; the mean for Mount Washington is 87; all uncorrected for altitude of stations.

WINDS.

Prevailing winds.—The most frequent winds are shown by the arrows on Chart No. II, and have been northwest in the central portion of the country between the Rocky and Alleghany Mountains, except south in Western Texas, Kansas, and Nebraska; northeast and southwest winds have been pretty equally felt along the Atlantic coast.

Highest winds.—Among the highest wind-velocities reported from the Signal Service stations for the month, are the following: Cape Hatteras and Cape Lookout (estimated, anemometer being broken), 17th, southeast, 100 miles per hour; Kittyhawk, 17th, south, 90; Cape Henry, southeast, 78; New River, N. C., 17th, northwest, 75; Barnegat, east, 64; Wilmington, 17th, northwest, 56; Norfolk, 17th, southeast, 55; Atlantic City, 17th, east, 52; Philadelphia, 17th, 52; Sandy Hook, 17th, northeast, 52; Mount Washington, 90; Fort Gibson, 19th, west, 52; Pike's Peak, 8th, 49; Cape May, 17th, southeast, 65.

Total movements of the air.—The following are the largest total movements of the air during the month, recorded at Signal Service stations: Cape May, 11,778 miles; Sandy Hook, 11,406; Barnegat, 11,027; Pike's Peak, 10,829; Cape Lookout, 10,247; Dodge City, 9,871; Cape Henry, 8,755; Breckenridge, 8,208; North Platte, 8,169; Philadelphia, 8,143; New York, 8,022. The smallest movements are: Vicksburg, 1,836; Augusta, 2,135; Savannah, 2,184; Nashville, 2,216; Lynchburg, 2,310; Shreveport, 2,507; Portland, Oreg., 2,712; Montgomery, 2,920. These figures indicate the prevalence of highest winds on the Atlantic coast, from North Carolina to New Jersey, and also on the northwestern plains, and the prevalence of feeblest winds in the interior of the Southern States.

VERIFICATIONS.

Probabilities.—The comparison of the tri-daily published Probabilities with the telegraphic reports received during the succeeding twenty-four hours gives the following results: The percentage of verifications has averaged for New England, 83.4; Middle States, 87.1; South Atlantic States, 80.1; Eastern Gulf States, 84.4; Western Gulf States, 83.8; Tennessee and Ohio Valley, 85.5; Lower Lake region, 85.1; Upper Lake region, 81.5; Upper Mississippi Valley, 79.8; Lower Missouri Valley, 76.95. The average for the whole country is 82.8 per cent. The general average for the respective elements is: For the weather, 85.7; direction of wind, 83.8; temperature, 79.2; barometric changes, 82.5. There were 31, or 0.86 per cent., omissions to predict.

Cautionary signals.—During the month, 125 cautionary signals were ordered to be displayed at the Signal Service stations on the Lakes, Gulf, and Atlantic coasts. Of these, 3 were ordered late, 27 were reported not justified, and 95, or 76 per cent., were fully justified by high winds near the respective stations. Forty-three cases are reported of winds exceeding 25 miles, for which no cautionary signals were ordered.

NAVIGATION.

Height of rivers.—The table on Chart No. III gives the highest and lowest readings at the Signal Service river-gauges. The Red River and the Missouri, above Omaha,

have experienced a steady decline. The Lower Missouri, the Mississippi, and Ohio have been occasionally swelled by the rains. The Ohio was highest from the 19th to the 24th, and the Mississippi at Cairo rose pretty steadily from the 3d to the 21st, and at Memphis from the 5th to the 23d. At Keokuk, the river very nearly reached the "danger line" on the 10th, and the Ohio rose slightly above the "danger line" on the 19th at Pittsburgh, and 23d at Cincinnati.

The Signal Service observers report that the east winds attending the hurricane of the 16th and 17th, caused unusually high water along the Atlantic coast; at Atlantic City, N. J., the highest water was reported on the 17th; at Pembina, Dak., the Red River of the North was unusually low during the latter part of the month; at Pittsburgh, Pa., the river was very low from the 1st to 9th, it rose rapidly on the 10th, when navigation was resumed. The voluntary observers report as follows: The water in Lake Michigan was extremely high on the 30th at North Point, Mich. The Connecticut River has been lower than ever before known; at Westminster, Vt., it was lowest on the 7th.

TEMPERATURE OF WATER.

As heretofore, the maximum and minimum temperatures, at or near the bottom, with the average depth of water, are given in the table on the lower right-hand corner of Chart No. III. The *smallest ranges* are 2° at Eastport, 4° at Portland, 5° at Cleveland; and the *greatest* are 20° at Norfolk and Saint Paul, 21° at Keokuk, 19° at La Crosse and Duluth. The *highest maxima* are 90° at Key West, 89° at Jacksonville, 83° at Montgomery, 87° at Mobile and Savannah, 85° at Augusta. The *lowest minima* are 48° at La Crosse, 49° at Eastport, 50° at Duluth.

ATMOSPHERIC ELECTRICITY.

Thunder storms—have been reported as follows: September 1st, Colorado, Georgia, Illinois, Indiana, Kansas, Louisiana, Massachusetts, Maine. Mississippi, Missouri, New Hampshire, New York, Ohio, Pennsylvania, Tennessee, Texas, Vermont; 2d, Alabama, Colorado, Dakota, Georgia, Kansas, Louisiana, Maine, Mississippi, Nebraska, New York, Pennsylvania, Texas, South Carolina; 3d, Florida, Georgia, Illinois, Iowa, Kansas, Michigan, Mississippi, Montana, Nebraska, Wisconsin; 4th, Colorado, Dakota, Georgia, Illinois, Indiana, Iowa, Kansas, Maine, Mississippi, Nebraska, New Hampshire, Ohio, Pennsylvania, Utah; 5th, Illinois, Indiana, Iowa, Kansas, Missouri, Mississippi, Nebraska; 6th, Dakota, Illinois, Iowa, Kansas, Nebraska, North Carolina, Pennsylvania, Virginia; 7th, Illinois, Indiana, Iowa, Kansas, Nebraska, North Carolina, Ohio, Virginia; 8th, Connecticut, Dakota, Delaware, Indiana, Illinois, Iowa, Kansas, Mississippi, Nebraska, New Hampshire, New York, Ohio, Vermont, Virginia; 9th, Arkansas, Illinois, Indiana, Iowa, Louisiana, Michigan, Missouri, Ohio, Tennessee, Texas, Wisconsin, Indian Territory; 10th, Alabama, Florida, Georgia, Mississippi, Ohio, Tennessee, South Carolina, North Carolina, Pennsylvania, West Virginia; 11th, Alabama, Florida, Georgia, Kansas, Mississippi, Nebraska, New York, North Carolina, South Carolina; 12th, Georgia, Kansas, Nebraska, North Carolina, South Carolina; 13th, Georgia, Indiana, Kansas, Michigan, Ohio; 14th, Delaware, District of Columbia, Florida, Georgia, Maryland, Michigan, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Virginia, West Virginia; 15th, Georgia, Maine, Montana Territory, New York, New Jersey, Pennsylvania, Vermont; 16th, Kansas, Nebraska, New Jersey, New York, South Carolina, Utah; 17th, Iowa, Kansas, Nebraska, North Carolina; 18th, Kansas, Minnesota, Nebraska, Texas; 19th, Indian Territory; 20th, Illinois, Michigan, Mississippi, North Carolina, Tennessee; 21st, Alabama, Georgia, Indiana, North Carolina, Ohio, Tennessee; 22d, Minnesota, New York, Ohio; 23d, Delaware, Indiana, Iowa, Michigan, North Carolina, South Carolina, Virginia; 24th, Dakota, Iowa, Minnesota, Nebraska; 25th, Illinois, Indiana, Iowa, Ohio, Pennsylvania, Tennessee, Wisconsin; 26th, Michigan, Mississippi; 27th, Colorado, Iowa, Nebraska; 28th, Illinois, Kansas, Michigan, Nebraska, Indian Territory; 30th, North Carolina.

Auroras.—The principal auroras have been those of the 13th, 22d, 25th, and 26th They have been observed as follows: On the 13th, Maine, Massachusetts, New York Dakota, New Hampshire, Vermont; 14th, Indiana, Vermont, Michigan; 15th, Dakota; 16th, Kansas; 18th, New York; 22d, Maine, Massachusetts, Michigan, Montana Territory, New Hampshire, New York, Vermont, Dakota, Rhode Island; 23d, Dakota, Ohio, Minnesota; 24th, Iowa; 25th, Dakota, Iowa, Maine, Massachusetts, Michigan, New York, Minnesota; 26th, Iowa, Michigan, New York, Ohio, Dakota, Illinois, Minnesota, Massachusetts, Wisconsin; 27th, New York, Ohio, New Jersey; 28th, Dakota, New York.

Solar halos—were observed on the 1st in Ohio, Illinois; 3d, Ohio, South Carolina, Michigan; 4th, Iowa, Vermont, South Carolina; 5th, Ohio, Vermont, Virginia, Wisconsin. District of Columbia; 6th, New York, Ohio, New Jersey, District of Columbia; 7th, New York; 8th, Ohio, Tennessee, Michigan; 9th, Rhode Island; 10th, Maine. Massachusetts, New Hampshire, New York, Ohio; 11th, Ohio, South Carolina; 12th, Kansas, Georgia;

13th, Indiana, Tennessee; 14th, North Carolina, Maine; 15th, Michigan; 16th, Connecticut, Maine, Massachusetts, New Hampshire, New York, Ohio, Tennessee, Michigan; 17th, New Hampshire, Tennessee, New York; 18th, Ohio, Iowa, Minnesota; 19th, Kansas; 20th, Indiana, Ohio, Virginia, West Virginia, South Carolina, Wyoming Territory, Michigan, Georgia; 21st, Ohio, South Carolina; 22d, North Carolina; 23d, Connecticut, Maine, Massachusetts, New Hampshire; 24th, New Hampshire, Maine, Louisiana; 25th, Ohio, Tennessee, Michigan; 26th, New Mexico; 27th, Indiana, Michigan, Wisconsin; 28th, Tennessee, Vermont, South Carolina, Dakota; 29th, Connecticut, New Hampshire, New York, New Jersey, Colorado, Maine, Rhode Island, Georgia; 30th, Mississippi, South Carolina.

Lunar halos.—1st, in New Jersey, Illinois, Tennessee, North Carolina; 2d, Pennsylvania, Missouri, Georgia; 3d, Maine, South Carolina, North Carolina, Missouri, Massachusetts, Georgia, Mississippi, Indiana, Pennsylvania; 4th, Minnesota, Michigan, Iowa, Alabama, North Carolina, Missouri, Louisiana, Dakota Territory, Kansas, Ohio, Wisconsin; 5th, Ohio, Michigan, Kansas, West Virginia, Alabama, Virginia, North Carolina, New Mexico, District of Columbia, Indiana; 6th, New York, New Jersey, Massachusetts, Connecticut, North Carolina, Maine, Tennessee; 7th, North Carolina, New Jersey, Tennessee; 8th, North Carolina, Missouri, Ohio; 23d, Tennessee; 24th, Georgia, Maine, North Carolina, Mississippi, Tennessee; 25th, New Jersey, North Carolina, Missouri, New Mexico, Mississippi, Tennessee; 26th, Minnesota, Ohio, Tennessee; 27th, Minnesota, Maine, Dakota Territory, Florida, North Carolina, Missouri, New Hampshire, New York, Tennessee; 28th, Georgia, South Carolina, North Carolina, Illinois, Dakota Territory, Connecticut, Nebraska, Missouri, Virginia, Kansas, Minnesota, Tennessee; 29th, South Carolina, Ohio, Colorado, Alabama, North Carolina, Florida, Connecticut, Illinois, Massachusetts, New Hampshire, New Jersey, New York, Tennessee, Wisconsin; 30th, Michigan, Florida, Alabama, Indiana, Minnesota.

Mirage was observed at Great Bend, Kan., on the 15th, 21st, 26th, 27th, 29th, and 30th; New London, Conn., 5th, 11th, 13th, 19th, 20th, and 21st; Tybee Island, 12th; Breckenridge, Minn., 4th, 7th, and 25th.

MISCELLANEOUS PHENOMENA.

Zoological.—*Geese* were seen at Lower Brule agency, Dak., 19th, 20th, 25th, 27th; Hennepin, Ill., flying southwest, 29th; at Rockford, Iowa, flying south, 26th; Burlingame, Kans., flying south, 27th; Great Bend, Kan., arrived on 20th; Clear Creek, Neb., flying south, 20th; Richmond, Neb., flying south, 19th; Bismarck, Dak., flying south, 27th; Duluth, flying south, 29th; Dubuque, Iowa, flying south, 16th and 28th; Fort Sully, Dak., flying south, 20th to 23d; Keokuk, Iowa, flying south, 21st; Pembina, Dak., flying southeast 23d. *Ducks* were seen at Lower Brule agency, Dak., flying south, 15th, 18th, 22d; Clear Creek, Neb., flying south, 18th. *Cranes* seen at Great Bend, Kans., flying south, 19th; Bismarck, Dak., flying south, 27th and 28th; Breckenridge, Minn., flying south, 12th and 15th. *Swallows* last seen at Somerset, Mass., on 23d; left Fall River, Mass., 17th; chimney swallows last seen at Contoocookville, N. H., on 19th, and barn swallows last seen on the 6th; swallows last seen at Wappinger's Falls, N. Y., on 16th. *Kingbirds*, Contoocookville, N. H., last seen on the 14th. *Robins* left Urbana, Ohio, 16th. *Blackbirds* were seen at Golden City, Colo., flying south, on the 30th; at Sedgwick, Kans., flying south, 20th; Urbana, Ohio, left on the 25th. *Plover* seen at Sedgwick, Kans., flying south, 20th, and *Blue-jays* seen at Sedgwick, Kans., 21st. *Wild pigeons* were seen at Jacksonburg, Ohio, flying northwest, 3d. *Grasshoppers*, flying northeast, on 8th, at Fort Garland, Colo.; flying north at Fort Wallace, Kans., 4th; flying at Fort Richardson, Texas, from 14th to 18th; at Golden, Colo., flying east-southeast 2d and 4th, flying northwest 6th, flying west and northwest 15th, flying east-southeast 23d, flying northwest 25th; Burlingame, Kans., in large numbers, 9th, 10th, 11th, 15th, 20th, 21st; Le Roy, Kan., arrived on the 9th; Council Grove, Kans., flying south 4th, 9th, 10th, 13th, 14th, and 20th, less numerous 27th; Oregon, Mo., flying north 1st, northwest 2d, 4th, 6th, south 11th and 19th, northwest 22d, southwest 23d and 25th, and south 26 h; Plattsmouth, Neb., flying about 1st to 15th; Richmond, Neb., flying north 4th and 6th, northeast 20th, northwest 21st; Breckenridge, Minn., flying south 26th; Corsicana, Texas, flying south 21st and 22d, west 23d, on 30th were destroying everything, and depositing millions of eggs; Cheyenne, Wyo., flying southeast 1st, 10th, 24th, south 6th, northwest 8th; Dodge City, Kans., abundant, flying north 2d and 4th, east 8th and 9th, less abundant 6th and 7th; Denver, Colo., more or less abundant 1st to 24th; Fort Sully, Dak., disappeared on 1st; Fort Gibson, Ind. Ter., 16th to 28th; Salt Lake City, Utah, migrating 28th; Omaha, Neb., carried away by high winds, 1st. *Locusts*—at Sedgwick, Kans., destroying gardens 8th, flying southeast 9th and 20th; at Coalville, Utah, flying south 26th, 27th, 28th.

Water-spout.—The observer at New River, N. C., reports as follows upon a water-spout which occurred on the 13th: At 5.20 p. m. a strange phenomenon was observed originating from the apex of a cumulo-stratus cloud, very near the beach. The base

of the cloud was apparently about two hundred feet above the surface of the sea; a rushing noise and gyratory motion at the base of the cloud attended the phenomenon at its first appearance, and soon the cloud projected downward, lashing the sea in a furious manner; a deafening roaring of the water was heard, and in a few moments a completely-formed water-spout appeared; the column of water rose to the height of about forty feet, having a diameter of about twenty feet at its base. The water-spout now moved northward towards the beach, and twenty minutes after its formation the cloud rose and the column of water fell obliquely, in the direction of its course, on the beach, cutting a trench in the land, ten feet in depth and twenty-five feet in width, throughout the entire length of the column.

Icebergs.—September 18th, in latitude 46° 42′ north, longitude 48° 30′ west; 20th, in latitude 46° 40′ north, longitude 47° west; 26th, in latitude 45° 29′ north, longitude 51° 3′ west; 27th, eighty large icebergs were seen in the location ranging from latitudes 43° 30′ to 45° 57′ north, and longitudes 49° to 50° 38′ west.

Prairie or forest fires have occurred near the following stations: Pembina, Dak., 24th; Corsicana, Tex., 25th; Fall River, Mass., from 6th to 15th.

Zodiacal light, 22d, Golden, Col.; 26th and 27th, Carthagena, Ohio.

Polar bands have been observed as follows: Tybee Island, 12th; Guttenberg, Iowa, 18th, 19th, and 25th; Iowa City, Iowa, 27th; Tabor, Iowa 28th.

Meteors have been observed as follows: On the 2d at Lyndon and Carbondale, Ill. (northeast to southwest); 8th, Vevay, Ind.; 9th and 12th, Mount Auburn, Ohio; 15th, Leesburg, Ind., Davenport, Iowa; 16th, Lyndon, Ill., Sedgwick, Kans., Brookhaven and Fayette, Miss., Fort Sully, Saint Louis; 17th, Leesburg, Ind., Mount Auburn, Ohio, Davenport, Iowa; 18th, Leesburg, Ind., Rocky Run, Wis.; 20th, Abington, Ill., Davenport, Iowa; 21st, Lyndon, Ill., brilliant 1.40 p. m., west to north; Afton, Iowa, Brookhaven, Miss., Davenport, Iowa; 22d, West Charlotte, Vt., Davenport, Iowa; 23d, Moorhead, Minn., Brookhaven, Miss., Jacksonburg, Ohio; 24th, Litchfield, Mich., Davenport, Iowa; 25th, Anna, Ill., Starkey, N. Y.; 26th, Vevay and Leesburg, Ind., Davenport, Iowa; 27th, Abington, Ill.; 29th, Ephrata, Penn.

Earthquakes.—September 21st a slight shock was reported at Fort Adams, R. I.; it was apparently from east to west, and lasted about ten seconds. On the same day shocks were felt at Bedford, Fair Haven, Fall River, Amherst, Dartmouth, Somerset, and Wood's Holl, Mass., and at Newport, R. I. On the 24th a heavy shock was reported at Friendsville, Ill., and a slight shock at Saint Louis, Mo.; it was also felt at New Harmony and Saint Meinrad, Ind. On the 25th two distinct shocks were felt at Mount Carmel, Ill., 12.15 a. m.; quite sensible shocks were also noticed at Belleville and other points in Southern Illinois. On the same day a slight shock was experienced at Indianapolis, Ind., and two violent shocks were reported at Evansville, Ind. On the 26th a slight shock was reported at Friendsville, Ill.

Published by order of the Secrtary of War.

ALBERT J. MYER,
Brig. Gen. (Brevet Assigned), Chief Signal-Officer, U. S. A.

PAPER 29.

MONTHLY WEATHER REVIEW, OCTOBER, 1876.

INTRODUCTION.

In compiling the present review the usual data have been made use of. The most noticeable features of the month are: The hurricane of the 17th to 23d; lower temperatures in the districts east of the Rocky Mountains; large excess of rain-fall in some districts and large deficiencies in others; low water in the rivers.

BAROMETRIC PRESSURE.

In general.—The general distribution of the atmospheric pressure is represented upon Chart No. II. The highest reading for the month (30.64 inches) occurred at Yankton, night of the 14th, during the advance of high pressure No. IV; lowest (28.73 inches) at Key West, evening of 19th, while the hurricane was passing over. The pressure averages lower in all the districts than for October, 1873, 1874, and 1875.

Ranges in barometer.—San Diego, .29 inch; Portland, Oreg., 1.01; Rocky Mountain stations, .48 to .64; plains of Kansas and Nebraska, 1.15 to 1.23; Missouri Valley, 1.31 to 1.59; Red River of the North Valley, 1.51 to 1.66; Upper Mississippi Valley, 1.08 to 1.43; Upper Lake region, .99 to 1.47; Lower Lake region, .91 to 1.09; Ohio Valley and Tennessee, .79 to 1.02; New England, .87 to .96; Middle Atlantic States, .80 to .91; South Atlantic States, .72 to .90; Key West, 1.24; Gulf States, .63 to .77; Northern Texas and Indian Territory, .84 to 1.06.

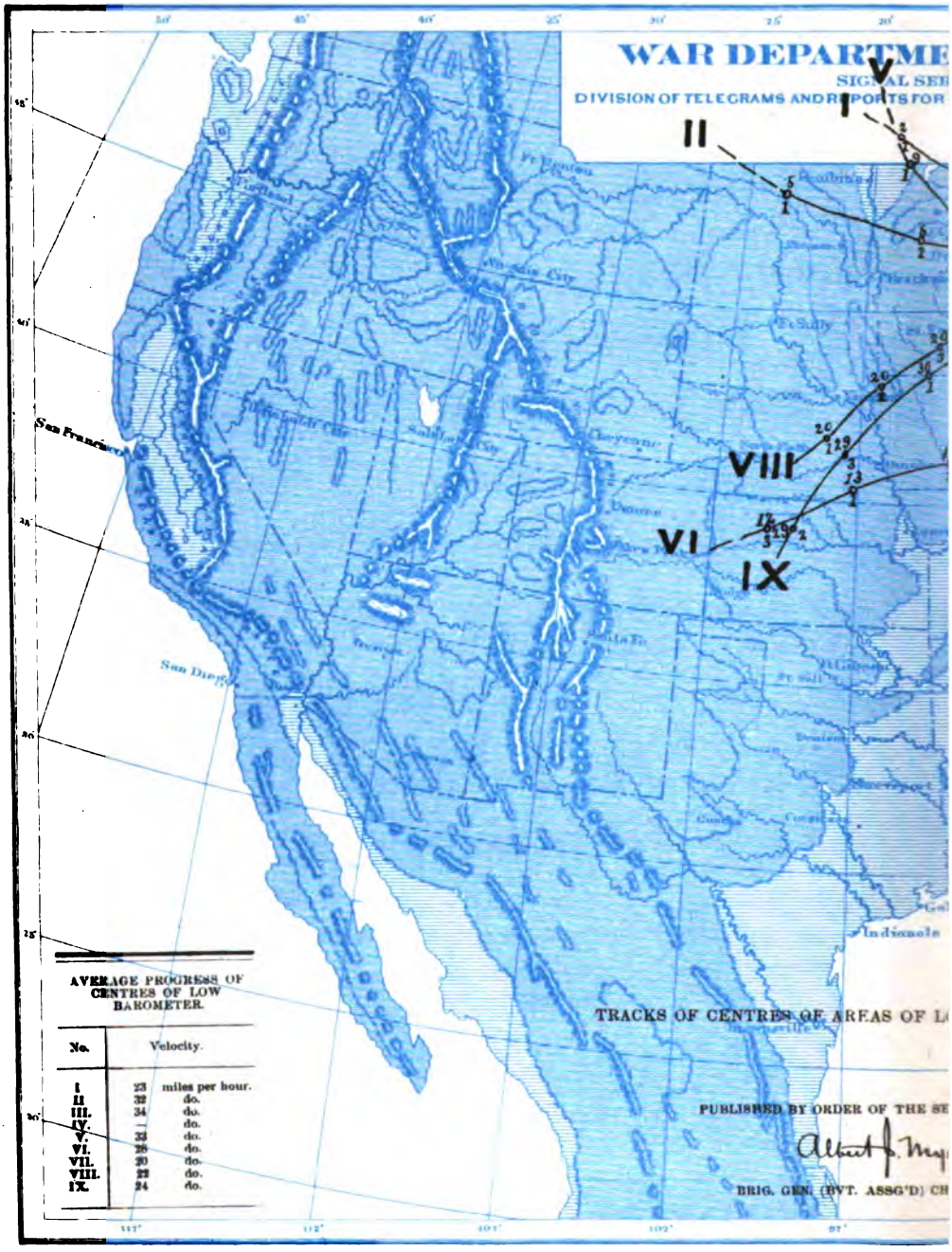
Areas of high pressure.—Of these, eight are described below. They have generally appeared in the Upper Missouri Valley, from whence their movements have been south and eastward across the country. Their advance has been frequently marked by high northerly winds and gales, especially when preceded by decided low-pressure areas, in the more northern districts and on the Texas coast. As in the case of the storm of the 14th and 15th, when rainy weather has preceded them, the fall in the temperature has been sufficient to turn the rain into sleet and snow, while frequent and heavy frosts have been produced.

No. I.—In the September Review this high-pressure area is described as No. VI. At 7.35 a. m. (Washington time), of the 1st, the highest (above 30.40 inches) was central in Texas, with diminishing northerly winds on that coast, and minimum temperatures of 22° at Breckenridge and Dodge City, 36° at Knoxville, and 41° at Corsicana. Frosts occurred as far southward as Indian Territory, Northern Louisiana, Georgia, and Virginia, and Western Pennsylvania, with ice in Kansas and Tennessee. On the morning of the 2d it was central in the Western Gulf States, with minimum temperatures slightly above 40° over the interior of the Gulf and South Atlantic States, heavy frosts to the interior of the Gulf and Atlantic States, and ice in Northern Georgia and South Carolina. By morning of the 3d, the highest (about 30.17) was in the Eastern Gulf States. In Northern New England, and from Central Florida northward over Eastern Kentucky and the interior of the South Atlantic and Middle States, the minimum was below 40°, with frequent frosts. During the 3d and 4th it was gradually dissipated under the influence of low pressure No. I. On the morning of the latter, the area in which the minimum fell below 40° extended from Wyoming and Nebraska to the Upper Lakes. Frosts were occasionally reported from Georgia and North Carolina to New York, and from Ohio to Nebraska. On the 5th frosts occurred from Kansas to Indiana and northward, and the area of freezing temperature was confined to Northern Michigan, Wisconsin, Minnesota, and Eastern Dakota.

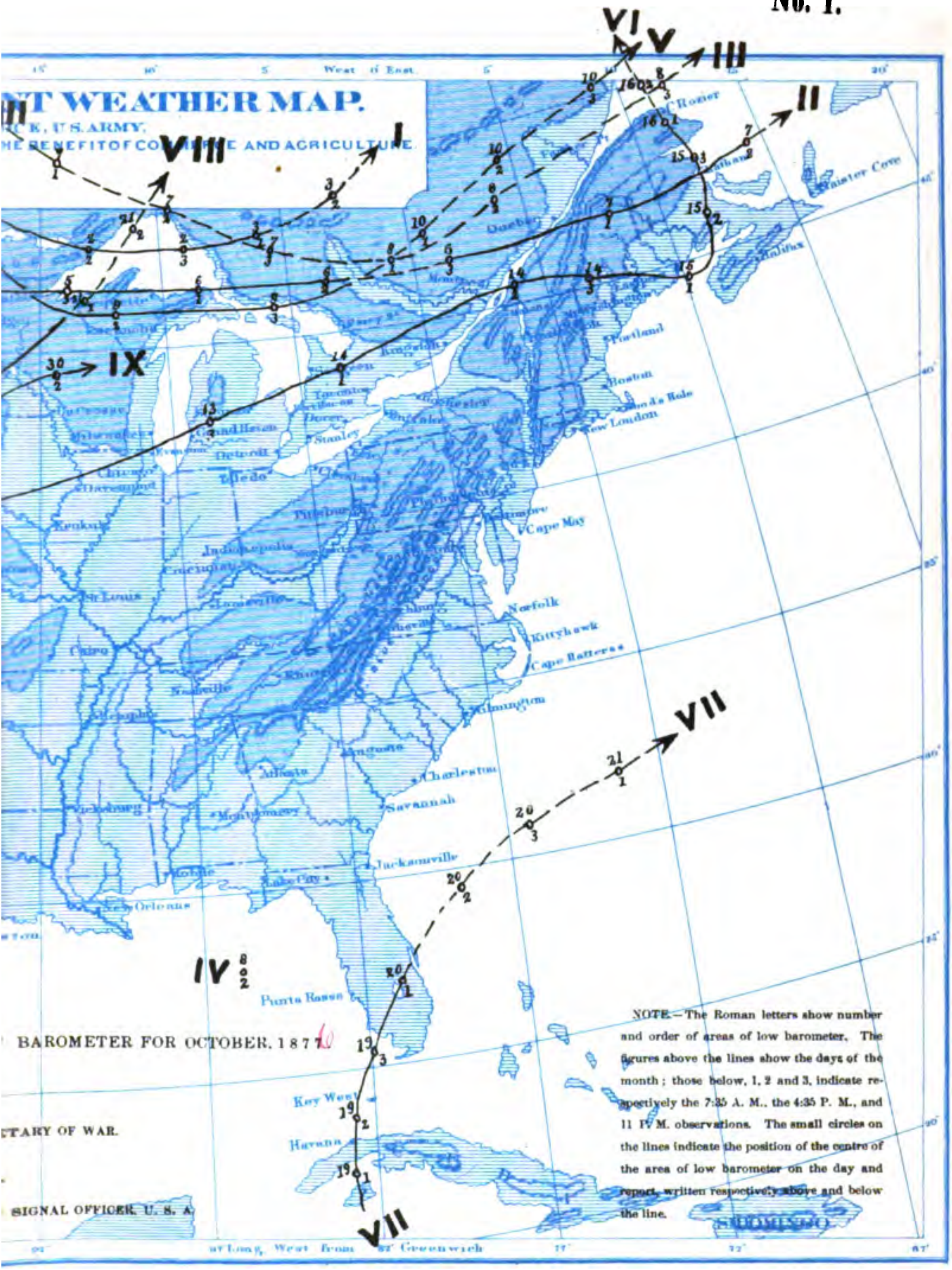
No. II. Following low pressure No. II, it was felt in the Missouri Valley on the 5th. The temperature fell below freezing during the night in Wyoming and Northern Dakota. At 7.35 a. m., of the 7th, it was central in Missouri and Arkansas. The minimum fell below 40° in Kansas, Missouri, Western Kentucky, and Ohio, with frosts as far south as Kansas, Missouri, Tennessee, West Virginia, Maryland, and Connecticut, and occasionally ice from Kansas to Kentucky. On the morning of the 8th the highest (30.30) was near and northwest of Memphis, its progress eastward having been checked by low pressures No. III to the north of it and No. IV in the Eastern Gulf. The frost-area reached Nebraska, Iowa, Tennessee, and Virginia. At 7.35 a. m., of the 9th, isobar (30.30) inclosed the country from Kentucky and the Ohio Valley to New Jersey. Freezing temperatures were reported from Minnesota and the Lakes to the interior of the Middle and Eastern States, and frosts from Kansas, Missouri, Tennessee, Middle States, and New England northward. During the 9th and 10th it lost its distinctive features, due to low pressures Nos. IV and V. On the latter morning an area in which the minimum was below 40° reached from Tennessee to New England, Nova Scotia, and New Brunswick, with reports of frost from Tennessee and Virginia, north and northeastward. The signals ordered the 6th on the Texas coast for a "norther" were not justified.

No. III. During the 9th it advanced southeastward over the Northwest, following low pressure No. V. On the morning of the 10th the highest (above 30.20) was in Dakota and Nebraska, and the temperature fell below freezing from Wyoming to Wisconsin, with a minimum of 19° at Breckenridge. By 7.35 a. m., of the 11th, the pressure had increased, and an area of 30.40 was central in Iowa, with temperatures below freezing from Northeastern Nebraska to Northern Ohio, and a minimum of 10° at Breckenridge. Frosts occurred as far southward as Arkansas, Northern Mississippi, Tennessee, West Virginia, Maryland, and New Jersey. During the day it continued southward and eastward, and by the morning of the 12th an area of above 30.40 covered the Middle Atlantic States. The minimum temperature was below freezing from Indiana to the interior of the Middle and Eastern States, and lowest (26°) at Cleveland. Frosts were reported from Mississippi to the interior of North Carolina, the Middle States, and New England. On the morning of the 13th the pressure had diminished, and isobar (30.20) included an extensive area, reaching from Pennsylvania and New Jersey to Northern Alabama. Frosts occasionally occurred from Tennessee and Kentucky to the Middle and Eastern States, with minimum (30°) at Cleveland, 32° at Washington, and 40° at Knoxville. During the 13th and 14th it was gradually dissipated in the Southern States as low pressure No. VI advanced eastward.

Nos. IV and V. Following low pressure No. VI, the former was first observed in Manitoba on the 12th, but its progress south and eastward was delayed until the 13th. At 7.35 a. m., of the 14th, isobar 30.50 included an area extending from Western Nebraska over Dakota and Manitoba, with minimum temperature of 6° at Pembina, and near or below freezing from Nebraska to Northern Michigan. On the morning of the 15th it was central in Iowa, with a minimum of 1° at Breckenridge, and freezing temperatures as far southward as Kansas, Missouri, Kentucky, and interior of Middle and


WAR DEPARTME
SIGNAL SER
DIVISION OF TELEGRAMS AND REPORTS FOR
II
V
VIII
VI
IX
San Francisco
San Diego
Salt Lake City
Cheyenne
Denver
Santa Fe
Indianola
AVERAGE PROGRESS OF CENTRES OF LOW BAROMETER.
No. | Velocity.
I 23 miles per hour.
II 32 do.
III. 34 do.
IV. — do.
V. 33 do.
VI. 28 do.
VII. 20 do.
VIII. 22 do.
IX. 24 do.
TRACKS OF CENTRES OF AREAS OF L
PUBLISHED BY ORDER OF THE SE
BRIG. GEN. (BVT. ASSG'D) CH

No. I.



NT WEATHER MAP.
E BENEFIT OF CO[...]E AND AGRICULTURE.
BAROMETER FOR OCTOBER, 1877
TARY OF WAR.
SIGNAL OFFICER, U. S. A.
NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:35 A. M., the 4:35 P. M., and 11 P. M. observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.
I
II
III
IV
V
VI
VII
VIII
IX
Quebec
Montreal
Portland
Boston
New London
Cape May
Norfolk
Kittyhawk
Cape Hatteras
Wilmington
Charleston
Savannah
Jacksonville
Punta Rassa
Key West
Havana
Halifax
Toledo
Chicago
Keokuk
Indianapolis
Cincinnati
St Louis
Cairo
Nashville
Memphis
Atlanta
Augusta
Montgomery
Mobile
New Orleans
Vicksburg
Lake City
Pittsburg
Buffalo
Toronto
Kingston
Grand Haven
Detroit
Milwaukee
Davenport
Long. West from Greenwich

Eastern States. Reports of frosts came from Indian Territory, Arkansas, Tennessee, Middle States, and New England. On the morning of the 16th the highest (30.40) was central in Eastern Tennessee, with temperatures near or below freezing from Indian Territory to North Carolina and northeastward, and a minimum of 25° at Knoxville. Frosts occurred as far southward as the interior of the Gulf States and the Carolinas. By morning of the 17th the pressure had diminished somewhat, and was central in Northern Georgia, with frosts thence north and northeastward, and a minimum temperature of 25° at Knoxville. During the 17th high pressure No. V advanced southeastward over the Lake region, the two combined by morning of the 18th, and isobar 30.20 inclosed the country reaching from North Carolina northward over the Lower Lakes into Canada. Minimum temperatures of 22° at Parry Sound, 33° at Washington, and 40° at Augusta were reported, with frosts as far southward as Tennessee and interior of North Carolina, At 7.35 a. m., of the 19th, it was central in the Middle Atlantic States, with minimum temperatures near or below freezing from Eastern Tennessee northeastward over the Middle and Eastern States. Frosts occurred from Virginia northeastward. In advance of low pressure No. VIII, and the hurricane moving northward over Florida, it gradually disappeared on the 19th and 20th on the New England coast. On the morning of the latter frosts were occasionally reported from New York and New England.

No. VI. On the morning of the 20th the pressure was quite high at Portland, Oreg.; the temperature below freezing at Virginia City, Cheyenne, and Santa Fé, and continued below on the following morning, with rising barometer. During the night of the 21st it extended southeastward over Texas, where, in connection with a minor depression left by low pressure No. VIII, a severe "norther" was produced. At Indianola a wind velocity of 44 miles per hour was recorded, and at Galveston, 48 miles. At 7.35 a. m., of the 22d, it was central in Southern Texas, with a minimum temperature of 27° at North Platte, and occasional frosts from Kansas to New Mexico, after which it gradually lost its distinctive features in the Gulf States.

Nos. VII and VIII. On the 23d the former advanced southeastward over the Missouri Valley, with minimum temperatures on the following morning of 25° at Bismarck and 28° at Denver. By 7.35 a. m., of the 25th, the pressure had increased, and the highest (above 30.20) was central over the Lower Mississippi Valley, with frosts as far southward as Tennessee and North Carolina, and minimum of 20° at Breckenridge, 36° at Fort Gibson. During the day it moved eastward over the Gulf States, and No. VIII advanced southward over Manitoba, with a minimum of 11° at Pembina, and frosts from the Carolinas and Tennessee northward on the morning of the 26th. By 7.35 a. m., of the 27th, the two had united, and isobar 30.40 included the country from Ohio to Northern Georgia and the Carolinas. Frosts occurred from Northern Missouri, Tennessee, and North Carolina north and eastward, with minimum temperatures of 26° at Grand Haven and 32° at Lynchburg. By the following morning, in advance of low pressure No. IX, it had moved southward and covered the South Atlantic States, with frosts in Middle States and New England. At 7.35 a. m., of the 29th, it was central in Southern Georgia, but with diminished pressure, where it continued on the 30th.

No. IX. During the night of the 28th it advanced southeastward from Canada toward the Middle and Eastern States, with temperatures below freezing in New York and New England. At 7.35 a. m., of the 30th, it was central over Eastern New York, with frost from New Jersey north and northeastward. During the 30th it apparently extended southward, probably united with No. VIII, and was central in the Carolinas on the morning of the 31st.

Areas of low pressure.—Nine have been traced and charted upon Map No. I. Excepting the hurricane of the 17th to 23d, the centers of all have moved over the northern sections, and farther northward than during previous Octobers. They have been frequently accompanied by barometric troughs, extending south or southwestward toward the Gulf, in which rainy weather and high winds or gales have prevailed.

No. I. During the night of the 1st its approach was indicated by a rapid fall of the barometer in Manitoba. On the 2d, as it progressed eastward, with a barometric trough extending toward Indian Territory, light rains fell in Manitoba and Northern Michigan at night, and the hourly wind velocity reached at Dodge City, north, 30; La Crosse, south, high; Marquette, south, 30; Escanaba, south, 28; Chicago, southwest, 26; Grand Haven, west, 36 miles. During the 3d light snow fell in Minnesota and Wisconsin, hail in Northern Michigan, and light rains thence to the Ohio Valley and Lower Lake region, with velocities at Erie, southwest, 28; Buffalo, west, 36; Cape Lookout, southwest, 32; Cape May, southwest, 36. On the 4th light rains occasionally fell from Lake Huron, the Lower Lakes, Ohio Valley, and Tennessee to the Saint Lawrence Valley and New Brunswick, with thunder-storms in New York and Tennessee and sleet or snow in Michigan. On Mount Washington a west gale prevailed; at Eastport, south, 26 miles. The 5th, light rains continued from North Carolina, Tennessee, and the Ohio Valley northeastward. A secondary depression was developed in Northern Texas the 4th and 5th, producing thunder-storms. Cautionary signals were displayed at the

lake stations on the 2d, nearly all which were justified, and warnings sent the Canadian lake stations.

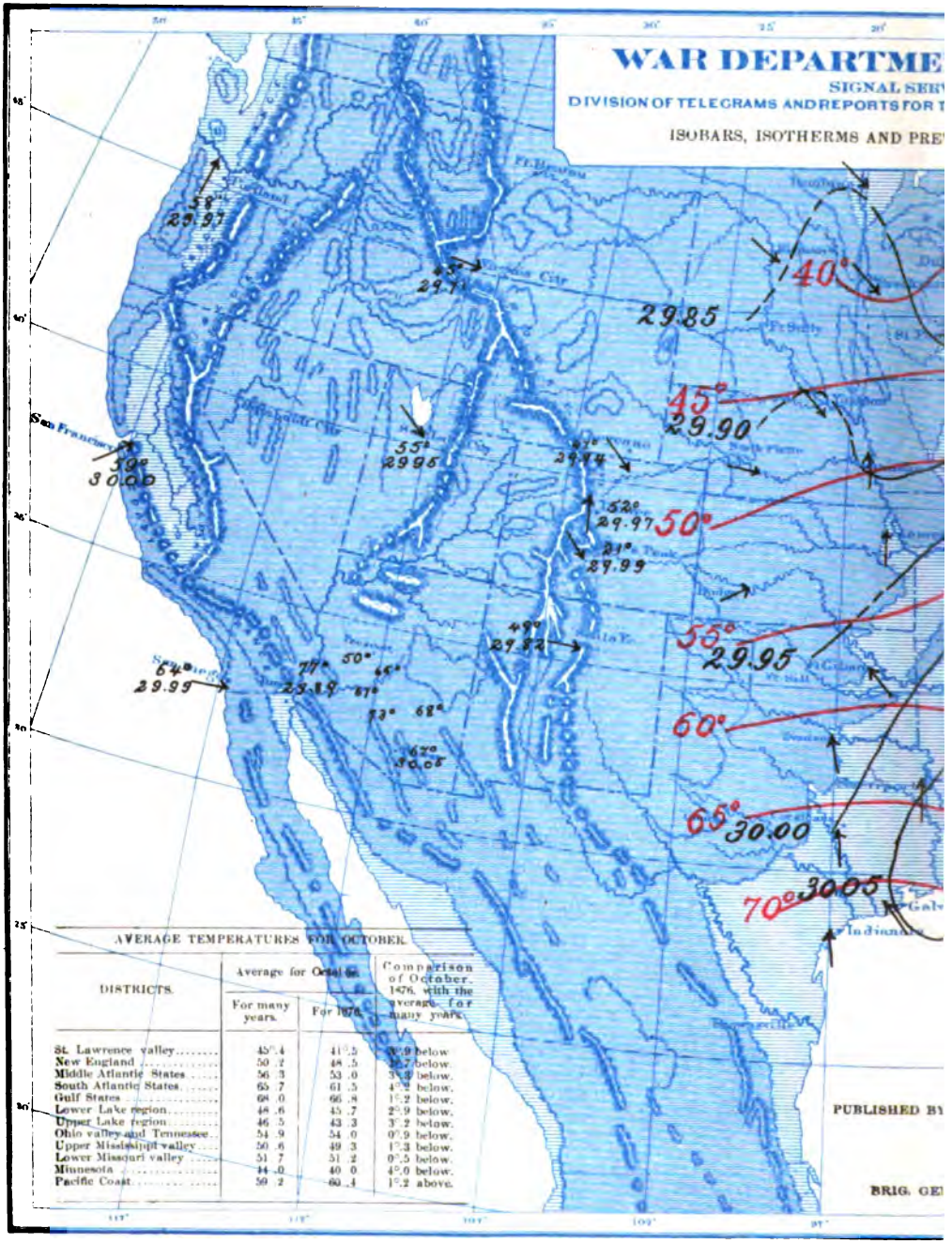
No. II. The night of the 4th this storm approached Minnesota. During the 5th snow accompanied it from Northern Dakota to Northern Michigan, with a fall of 6 inches at Duluth. The rain-area extended south to Iowa and east to Lake Erie, with occasional thunder-storms in Minnesota, Iowa, and Michigan. Lowest barometer (28.92) at Pembina; wind velocities at Bismarck, northwest, 69; Saint Paul, southwest, 36; Escanaba, south, 36; Alpena, southeast, 28; Detroit, west, 30. The 6th, as it passed eastward a trough was produced southward, and rainy weather reached Tennessee, Middle States, New England, and eastern British Provinces, with thunder-storms in Massachusetts. Maximum velocities: Duluth, northwest, 36; Grand Haven, northwest, 38; Erie, west, 36; Buffalo, west, 60; Rochester, west, 36; Morgantown, southwest, 40; Cape Hatteras, southwest, 36; Sandy Hook, west, 45; Wood's Holl, south 35. During the 7th thunder-storms occurred in Maine, and high northwest winds or gales along the Middle Atlantic and New England coasts; maximum, Cape May, 50; Sandy Hook, 48; Newport, 36; Mount Washington, a hurricane; off Savannah, a heavy southwest gale. Signals were ordered on the 5th along the lakes and New Jersey coast; the 7th, on the New England, Virginia, and North Carolina coasts. All were verified except for Maine. Cautions were also sent the Canadian stations.

No. III. On the 7th light snow occasionally fell from Northern Minnesota to Northern Michigan, and light rains thence to Lake Erie, accompanied by brisk winds, reaching, southwest, 31, at Grand Haven. During the 8th light rains, turning into sleet or snow, were reported from Michigan to Northern New England, and occasionally high winds. Rochester, west, 36; Sandy Hook, southwest, 40; Boston, west, 25. Not any signals were ordered.

No. IV. Its movement could not be traced. During the night of the 7th a thunderstorm occurred at Key West. A steamer thence to Galveston encountered a hurricane in longitude 87° 30′, and on the 8th a heavy "northwester." The latter date heavy rains fell from Northern Florida to North Carolina; at Newport, Fla., 8.2; at Saint Mark's, 5.47 inches. On the 9th and 10 rainy weather continued from Florida to Eastern North Carolina, with wind northeast, 30 at Cape Hatteras and Kittyhawk, and northeast, 38 at Cape Lookout. Signals displayed on the 8th and 9th from Saint Mark's to Cape Hatteras were reported verified from latter to Charleston only.

No. V. During the night of the 8th its advance was indicated by rapidly falling barometer in Manitoba and Minnesota. Its progress southeastward was very rapid on the 9th, and accompanied by high winds and gales from the Missouri Valley to the lakes. Light rains occasionally fell from Northern Minnesota to Lake Huron. Maximum velocities: Pembina, northwest, 40; Marquette, west, 38; Grand Haven, southwest, 55; Port Huron, south, 32. During the 10th its course was northeastward, with a barometric trough extending southwestward. Light rains, partly turning into snow, fell from Michigan and Lake Ontario to the Saint Lawrence Valley, and at night from Pennsylvania to Maine. Maximum velocities: Buffalo, Parry Sound, and Erie, west, 32; Oswego County, New York, tornado; Cape May, north, 37. On the 11th it disappeared over the Gulf of Saint Lawrence. In connection with hight pressure No. III, high winds and gales were produced along the Middle Atlantic and New England coast: Cape Lookout, northeast, 42; Kittyhawk, northeast, 40; Sandy Hook, northwest, 40; Thatcher's Island, northwest, 42; Mount Washington, west, hurricane. Cautionary signals were ordered on the 9th along the lakes, New England, and New Jersey coasts, and the 11th on the North Carolina coast, besides warnings sent the Canadian stations, all of which were justified excepting Duluth.

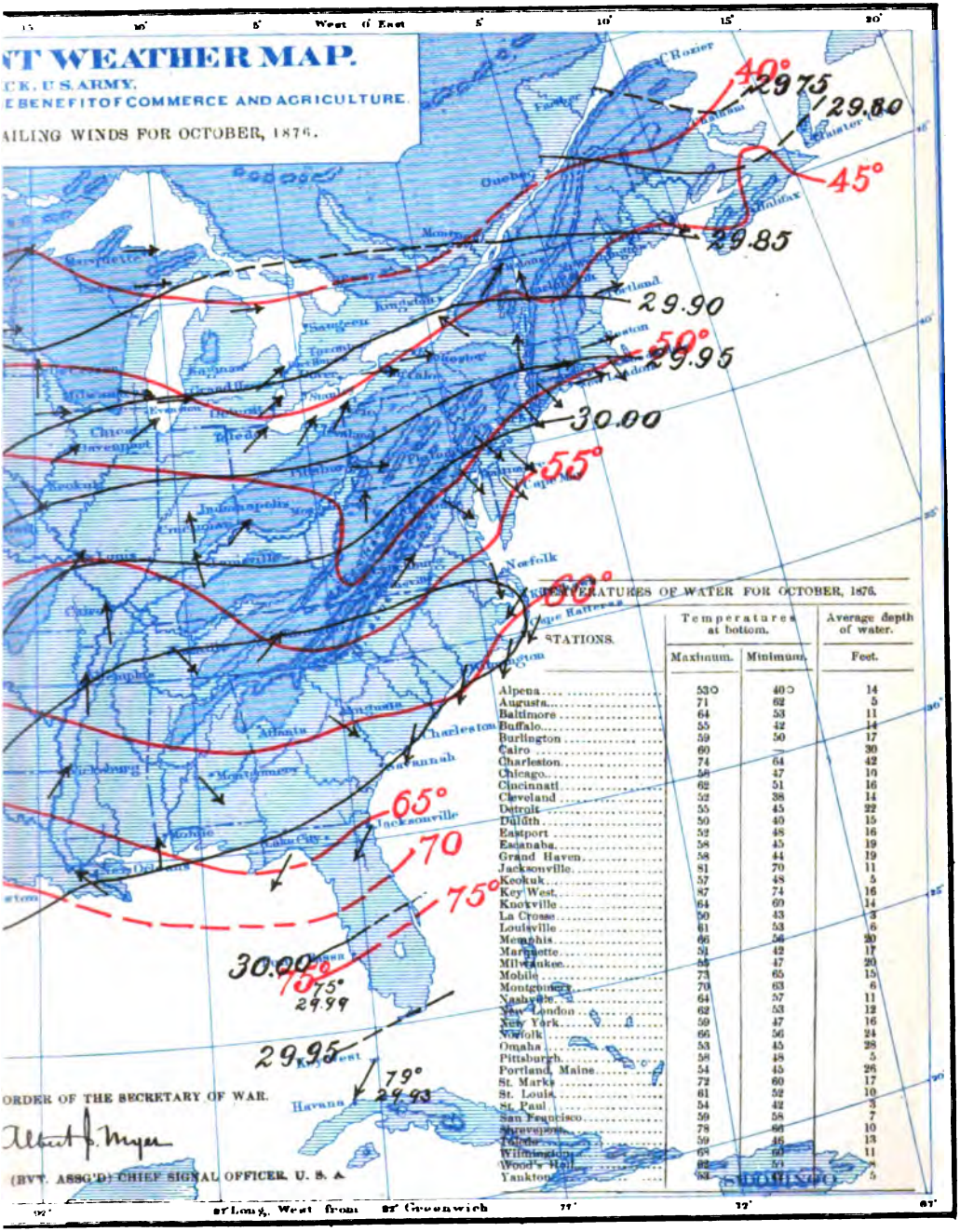
No. VI. During the night of the 12th it developed in the Lower Missouri Valley, and advanced northeastward the 13th, accompanied by occasional thunder-storms in Kansas, Nebraska, Missouri, Illinois, and Michigan, and snow in Northern Michigan and Manitoba. On the 14th it became more extensive, with diminishing pressure. Threatening and rainy weather prevailed from the Southwest northeastward over Tennessee and the Ohio Valley to Michigan, the Saint Lawrence Valley, and Nova Scotia, and gradually turning into snow or sleet from Michigan eastward. High winds were also frequently reported: Escanaba, northwest, 32; Rochester, west, 30; also thunderstorms from North Carolina and Maryland. Early during the morning of the 15th, snow fell as far southward as North Carolina; greatest depth, 3.5 inches, at Fall River, Mass., with the pressure still diminishing. Maximum velocities: Cape Hatteras, north, 38; Cape Henry, northwest, 48; Cape May, west, 48; Sandy Hook, northwest, 45; Newport, west, 36; Mount Washington, northwest, hurricane. The lowest barometric reading (28.87 inches) was reported from Chatham, New Brunswick, on the morning of the 16th. During the day the following velocities were recorded: Buffalo, west, 40; Rochester, west, 36; Eastport, northwest, 29; Sidney, west, 32; Father Point, west, 49. In the Gulf of Saint Lawrence very severe weather was experienced during the 15th and 16th; at Harbor Grace, Newfoundland, barometer, 29.38, with high westerly winds. Signals were displayed on the 14th along the Lower Lakes, New England, Middle Atlantic, and North Carolina coasts, and the 15th, from Nova Scotia to the



AVERAGE TEMPERATURES FOR OCTOBER.

DISTRICTS.	Average for October.		Comparison of October, 1876, with the average for many years.
	For many years.	For 1876.	
St. Lawrence valley	45°.4	41°.5	3°.9 below.
New England	50 .2	48 .5	1°.7 below.
Middle Atlantic States	56 .3	53 .0	3°.3 below.
South Atlantic States	65 .7	61 .5	4°.2 below.
Gulf States	68 .0	66 .8	1°.2 below.
Lower Lake region	48 .6	45 .7	2°.9 below.
Upper Lake region	46 .5	43 .3	3°.2 below.
Ohio valley and Tennessee	54 .9	54 .0	0°.9 below.
Upper Mississippi valley	50 .6	49 .3	1°.3 below.
Lower Missouri valley	51 .7	51 .2	0°.5 below.
Minnesota	44 .0	40 .0	4°.0 below.
Pacific Coast	59 .2	60 .4	1°.2 above.

No. II.



TEMPERATURES OF WATER FOR OCTOBER, 1876.

STATIONS.	Temperatures at bottom.		Average depth of water.
	Maximum.	Minimum.	Feet.
Alpena	53°	40°	14
Augusta	71	62	5
Baltimore	64	53	11
Buffalo	55	42	14
Burlington	59	50	17
Cairo	80		30
Charleston	74	64	42
Chicago	56	47	16
Cincinnati	62	51	16
Cleveland	52	38	14
Detroit	55	45	22
Duluth	50	40	15
Eastport	52	48	16
Escanaba	58	45	19
Grand Haven	58	44	19
Jacksonville	81	70	11
Keokuk	57	48	5
Key West	87	74	16
Knoxville	64	60	14
La Crosse	50	43	3
Louisville	61	53	6
Memphis	66	56	20
Marquette	51	42	17
Milwaukee	55	47	20
Mobile	73	65	15
Montgomery	70	63	6
Nashville	64	57	11
New London	62	53	12
New York	59	47	16
Norfolk	66	56	24
Omaha	53	45	28
Pittsburgh	58	48	5
Portland, Maine	54	45	26
St. Marks	72	60	17
St. Louis	61	52	10
St. Paul	54	42	3
San Francisco	59	58	7
Shreveport	78	66	10
Toledo	59	46	13
Wilmington	68	60	11
Wood's Hall	62	50	5
Yankton	53		

mouth of the Saint Lawrence, all of which were justified, except that those for the Lower Lakes were lowered too soon.

No. VII. From the data collected up to the present, this hurricane can only be traced from the 17th, when it was encountered by vessels in the Carribean Sea, south of Cuba, and in the vicinity of the Cayman Islands. On the 18th it struck the western half of Cuba. At 11.45 a. m., of the 19th, the barometer reached its minimum, about 28.7 inches, as recorded at Belen College Observatory, Havana, and the wind, which had varied between east, northeast and north-northeast, backed to north and fell to a calm. Therefore the path of the hurricane was directly over that city, and slightly to the eastward of Key West, as the following hourly observations, taken at latter, show:

Date.	Time.	Rain-fall.	Barometer.	Wind.		Date.	Time.	Rain-fall.	Barometer.	Wind.	
				Velocity; miles per hour.	Direction.					Velocity; miles per hour.	Direction.
October 19	1 a. m.	.....	29.65	.....	.....	October 19	4 p. m.	.....	28.92	66	NE.
	2 a. m.	.....	29.60	31	NE.		5 p. m.	.....	28.85	58	NE.
	3 a. m.	.....	29.60	30	NE.		6 p. m.	.....	28.80	35	W.
	4 a. m.	.....	29.60	28	NE.		7 p. m.	.....	28.77	14	SW.
	5 a. m.	.....	29.59	28	NE.		8 p. m.	.....	28.73	11	SW.
	6 a. m.	.....	29.58	31	NE.		9 p. m.	.....	28.80	63	SW.
	7 a. m.	.90	29.57	42	NE.		10 p. m.	.....	28.85	56	SW.
	8 a. m.	.....	29.52	39	NE.		11 p. m.	3.00	28.91	50	SW.
	9 a. m.	.....	29.50	42	NE.		12 midn't	.....	29.20	40	SW.
	10 a. m.	.....	29.45	42	NE.	October 20	1 a. m.	.....	29.38	38	SW.
	11 a. m.	.....	29.35	44	NE.		2 a. m.	.....	29.42	35	SW.
	12 m.	.....	29.20	46	NE.		3 a. m.	.....	29.46	35	SW.
	1 p. m.	.....	29.15	49	NE.		4 a. m.	.....	29.50	30	SW.
	2 p. m.	.....	29.11	57	NE.		5 a. m.	.....	.....	28	SW.
	3 p. m.	.....	29.00	58	NE.		7 a. m.	.75	.....	.....	.....

At 7 p. m., of the 19th, the anemometer registered one mile in thirteen minutes; at 8.45 p. m., twenty-two miles for fifteen minutes, or at the rate of 88 miles per hour. Over the southern half of Florida and in the Florida Straits it was unusually severe on the 19th and 20th. Very heavy rains fell thence northward along the South Atlantic coast, and light rains from Virginia to Southern New England. On the 20th in latitude 29° 50′ north, longitude 79° 45′ west, the wind backed from east to northwest; off Cape Canaveral, Fla., shifted from east to northwest, barometer 28.82; 32° 32′ north, 73° 30′ west, veered from eastsoutheast to west; 37° north, 69° west, backed from south-southeast to north-northeast; 21st, 30° north, 71° 30′ west, veered from south-southwest to northwest; 30° 37′ north, 75° 30′ west, shifted from east to west, with sea rolling mountains high; 30° 50′ north, 65° west, veered from south to west-northwest. At Bermuda a southeast gale commenced on the 20th, veered to south on 21st, to southwest by morning of 22d, with barometer 29.35 inches and heavy rain; morning of 23d, barometer 29.30, wind began to moderate, veered to west by noon, and the rain ceased. Off Bermuda a heavy southwest gale, veering to northwest, was experienced on the 23d. Cautionary signals were ordered to be displayed on the 19th along the Gulf and South Atlantic coasts, and on the 20th along the Middle Atlantic and Southern New England coasts, and the stations notified of the presence of the hurricane. Those along the South Atlantic coast alone were justified, but the warnings served to prevent vessels from running out of port and into the hurricane.

No. VIII. This storm can be traced to the Pacific coast. In Washington Territory and Oregon frequent rains fell from the 15th to the 22d, with thunder-storms on 17th, 18th, and 19th in latter. At Portland, minimum barometer, 29.58, 11 p. m., 17th; at Camp McDermitt, Nev., snow on the 19th; Virginia City, Mont., snow 18th to 20th; Salt Lake City, snow 20th; Mount Carmel, Utah, thunder-storms, 17th and 18th; in Wyoming Territory, snow 18th to 20th; Pike's Peak, gales with snow 20th and 21st. From 17th to 19th there was a slow but steady decline in the barometer from the Mississippi Valley to the Rocky Mountains, with occasional thunder-storms from Texas, Louisiana, and Mississippi to Kansas and Illinois. During the 20th it could be definitely traced. High winds, threatening and rainy weather prevailed from Missouri and Ohio Valleys to the lakes, with thunder-storms from Wisconsin, Iowa, and Missouri to Michigan and Ohio; at Dodge City, west, 34; Duluth, northeast, 28; Keokuk, southwest, 40; Grand Haven, southwest, 34; Port Huron, southeast, 32; Toledo, southwest, 32; Erie, south-

east, 28. On the 21st it disappeared over Lake Superior, and occasional thunder-storms occurred from Texas and Louisiana to Illinois and Indiana. A secondary depression was left in the Southwest and passed into the Gulf, in rear of which a severe "norther" was felt on the Texas coast; at Indianola north, 44; Galveston, north, 48, night of 21st. Signals were displayed at Duluth the 19th and the other lake stations, excepting along Ontario, the 20th. All were justified except for Escanaba, Marquette, and Alpena.

No. IX. From the 25th to the 30th rainy weather prevailed in Washington Territory and Oregon, and the barometer reached its minimum, 29.42, at Portland, morning of 28th; snow fell in Nevada 27th to 30th; rain turning into snow in Montana 28th to 31st; Utah, 28th to 30th, and New Mexico, 31st; occasional snow in Wyoming, 29th. During the 27th there were indications of a storm advancing southeastward from Dakota; thunder-storms occurred from Kentucky and Ohio to Michigan, Wisconsin, and Indiana, with snow in Northern Michigan, and velocity northeast 28 at Duluth. On the 28th a barometric trough extended from the Missouri Valley toward the Ohio Valley and Middle States, in which thunder-storms were produced from Iowa to Michigan, Pennsylvania, and Ohio Valley, with rain and snow from Connecticut and New York to Michigan. High winds: Duluth, east, 28; Cape Lookout, southwest, 30. The 29th thunder-storms occurred from Kentucky and Ohio to Iowa. On the 30th it broke up into several minor depressions, with increasing pressure throughout the Northwest and Upper Lake region, and continued thunder-storms from Iowa to Michigan and Indiana. During the 31st light rains fell in Nova Scotia, New Brunswick, and the Saint Lawrence Valley; thunder-storms in Texas, New York, and from Kansas to Wisconsin, Michigan, and Ohio. Cautionary signals were ordered for Duluth the 29th, but not justified.

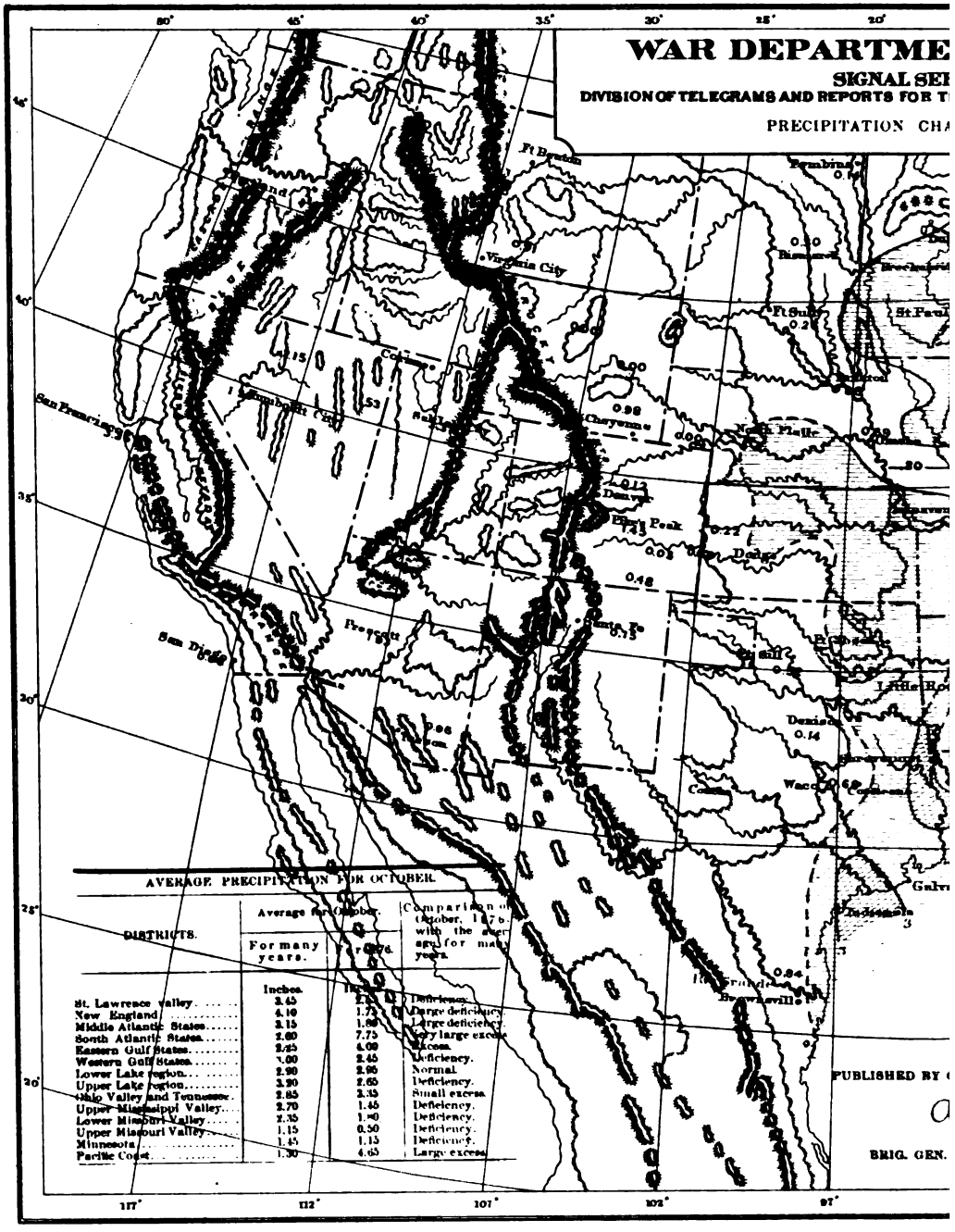
Local storms.—2d, at Stanwix, Ariz., southwest sand-storm; 3d and 4th, cyclone passed over Central America, with great destruction of property and loss of life, especially at Anagua and Blewfields, about latitude 12° north; steamer Costa Rica experienced same near Point Arenas, on the Pacific side, about 10° north; 12th, off Watch Hill, R. I., schooner capsized by whirlwind; Fort Yuma, Cal., and Stanwix, Ariz., south to southwest sand-storm; 19th, severe wind and rain storm over Boonville, Mo.; 20th, Fort Yuma, Cal., north, sand-storm; Stanwix, Ariz., north and northwest gale; 28th, Orleans, Ind., unusually heavy and destructive rain-storm; 31st, sand-storms at Maricopa Wells, Ariz., Fort Yuma (north,) and Vallecitas (northeast,) Cal.; at Stanwix, Arz., high north and northwest winds. A cyclone passed over the districts of Soonderbonds and Backergunje, and the months of the Ganges and Bramapootra Rivers, east of Calcutta, British India, night of the 31st, with an immense tidal wave. Late accounts say 120,000 persons perished.

Vessels experiencing storms.—On the 2d, latitude 47° 20′ north, longitude 41° 30′ west, heavy west-southwest to west-northwest gales; 3d, 46° north, 33° west, heavy northwest and southwest gales; 2d to 23d, 40° 20′ north, 41° 30′ west to banks of Newfoundland, continuous and terrific west-southwest to west-northwest gales: 4th, 45° north, 29° west, heavy gales; 5th, 50° north, 32° west, heavy gale; 7th, (?) 47° north, 5° west, violent hurricane; 10th, 51° 53′ north, 21° 10′ west, heavy gale; 51° 11′ north, 47° west, heavy gales; 15th, 45° north, 33° west, heavy west gale: 41° 15′ north, 65° west, violent west gale; off Cape Hatteras heavy gale; 16th, 49° 42′ north, 26° 04′ west, heavy north-northwest gale; 17th, between Capes Cod and Elizabeth, heavy northwest gale; off Spanish Town, near San Francisco, heavy gale; 20th, 57° north, 30° west, south to west gale; 24th, 49° 56′ north, 10° 54′ west, heavy southeast to northwest gale; 53° north, 55° west, heavy north gale; 29th, 19° north, 62° 30′ west, heavy gale.

TEMPERATURE OF THE AIR.

The isothermal curves and figures upon Chart No. II illustrate the general distribution of the temperature of the air for the present month. A reference to the table in the lower left-hand corner of the same chart will show that the average is above that for years on the Pacific coast; it is below in the other districts, especially in the South Atlantic and Middle Atlantic States, Minnesota, Saint Lawrence Valley, and Lake region.

Minimum and maximum temperatures, respectively, are given for the following stations, viz: Albany, 23°, 70°; Alpena, 25°, 65°; Atlantic City, 30°, 74°; Augusta, 36°, 86°; Boston, 26°, 70°; Bismarck, 14°, 74°; Breckenridge, 8°, 66°; Buffalo, 24°, 73°; Cairo, 32°, 83°; Cape Hatteras, 42°, 76°; Cape May, 34°, 73°; Cheyenne, 23°, 75°; Chicago, 28°, 73°; Cincinnati, 29°, 74°; Cleveland, 26°, 75°; Corsicana, 36°, 92°; Davenport, 25°, 75°; Denver, 24°, 85°; Detroit, 24°, 72°; Dodge City, 24°, 85°; Duluth, 23°, 67°; Eastport, 28°, 60°; Fort Gibson, 32°, 82°; Indianapolis, 26°, 75°; Indianola, 50°, 85°; Jacksonville, 43°, 85°; Key West, 68°, 91°; Leavenworth, 29°, 80°; Lynchburg, 32°, 80°; Malone, 21°, 74°; Marquette, 29°, 73°; Mobile, 43°, 82°; Mount Washington, 5°, 48°; Nashville, 29°, 86°; New London, 30°, 67°; New Orleans, 50°, 84°; New York, 31°, 73°; North Platte, 22°, 81°; Omaha, 23°, 75°; Oswego, 29°, 70°; Pembina, 6°, 76°; Pitts-



AVERAGE PRECIPITATION FOR OCTOBER.

DISTRICTS.	Average for October. For many years.	Average for October, 1876.	Comparison of October, 1876, with the average for many years.
	Inches.	Inches.	
St. Lawrence valley	3.45	2.55	Deficiency.
New England	4.10	1.73	Large deficiency.
Middle Atlantic States	3.15	1.68	Large deficiency.
South Atlantic States	2.60	7.75	Very large excess.
Eastern Gulf States	2.25	4.03	Excess.
Western Gulf States	4.00	2.45	Deficiency.
Lower Lake region	2.90	2.96	Normal.
Upper Lake region	3.90	2.65	Deficiency.
Ohio Valley and Tennessee	2.85	3.35	Small excess.
Upper Mississippi Valley	2.70	1.45	Deficiency.
Lower Missouri Valley	2.35	1.40	Deficiency.
Upper Missouri Valley	1.15	0.50	Deficiency.
Minnesota	1.45	1.15	Deficiency.
Pacific Coast	1.30	4.65	Large excess.

No. III.



HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, OCT. 1876.

STATIONS.	Danger point above zero.		HIGHEST WATER			LOWEST WATER		
			Date.	Height.		Date.	Height.	
	ft.	in.	Oct.	ft.	in.	Oct.	ft.	in.
RED RIVER.								
Shreveport	29	0	1	7	2	30	3	9
MISSOURI.								
Fort Sully	—		—	—		—	—	
Yankton	20		1	5	9	31	4	3
Omaha	16		1	6	1	31	3	1
Leavenworth	21		1	8	4	72	6	9
MISSISSIPPI.								
St. Paul	14	6	1	4	11	14to21	2	10
La Crosse	18		1,2	1	4	19to29	0	11
Dubuque	21	10	2	5	7	24to28	4	0
Davenport	15		2,3	4	4	27to31	2	10
Keokuk	14	6	1	8	8	24	3	11
St. Louis	30		1	14	9	30	7	3
Cairo	40		1	22	3	24, 25	7	10
Memphis	34		1	17	11	29	2	0
Vicksburg	41		6	25	0	31	11	6
New Orleans	2	6	9	9	5	31	—	—
CUMBERLAND.								
Nashville	40		28	5	11	19to21	0	10
OHIO.								
Pittsburgh	30		1	5	10	23to25	2	0
Cincinnati	50		1	14	3	28	4	0
Louisville	24		1	9	2	25	4	9
[illegible]								
[illegible]			22	8	6	19to20	4	7

ORDER OF THE SECRETARY OF WAR.

BVT. A.S.S.G'D) CHIEF SIGNAL OFFICER, U. S. A.

burgh, 28°, 80°; Pike's Peak, —2°, 41°; Philadelphia, 31°, 75°; Portland, Oreg., 42°, 79°; Salt Lake City, 30°, 83°; San Diego, 48°, 80°; San Francisco, 52°, 72°; Santa Fé, 27°, 78°; Shreveport, 38°, 85°; Vicksburg, 35°, 86°; Virginia City, 20°, 71°; Washington, 30°, 78°; Wilmington, 32°, 80°; Wood's Holl, 32°, 68°; Yankton, 16°, 77°.

Ranges of temperature.—At Key West, 23°; San Diego, 32°; San Francisco, 20°; Portland, Oreg., 37°; Gulf States, 34° to 56°; South Atlantic States, 34° to 50°; Middle Atlantic States, 39° to 48°; New England, 32° to 50°; Lower Lake region, 41° to 49°; Upper Lake region, 35° to 48°; Ohio Valley and Tennessee, 45° to 56°; Upper Mississippi and Lower Missouri Valleys, 47° to 52°; Valley of the Red River of the North, 58° to 70°; Dakota and western portions of Nebraska and Kansas, 59° to 61°; Pike's Peak and Mount Washington, 43°; Denver, 61°; Virginia City and Santa Fé, 51°; Cheyenne, 52°; Salt Lake City, 53°.

First frosts of the season.—Alabama, Mount Vernon and Green Springs, 2d. California, San José, 13th; Camp Independence, 22d and 23d. Connecticut, Southington, 2d. Colorado, South Pueblo, (just enough to kill vines), and Denver, 1st. Illinois, Anna and Cairo, 7th. District of Columbia, Washington, 8th. Indiana, Spiceland, 1st. Louisiana, Lake Charles, 2d (unusually early). Kentucky, Louisville, 7th. Maryland, Fallston, 8th. Massachusetts, Williamstown, 2d; Somerset, 3d; Westborough (also freeze), 3d; Worcester and Andover, 8th. Mississippi, Brookhaven and Fayette, 2d. New Hampshire, Shelburne,, 2d; Auburn, 8th. New Jersey, Freehold and Linden, 8th. New York, Brookhaven, 3d; Hudson, 7th; Rodman, 8th; Hector, 9th; New York City, 15th. North Carolina, Smithville, 2d; Attaway Hill, 4th. Ohio, Cincinnati (Mount Auburn), 7th. Pennsylvania, Chambersburg, 8th. Texas, Gilmer,, 1st; Melissa (heavy), 2d. Vermont, Norwich, 3d; Westminster, 8th. Virginia, Prospect Hill, 12th. West Virginia, Morgantown, 7th.

First heavy or killing frosts, freeze or ice.—Alabama, Green Spring, ice, 16th. Mississippi, Jackson, 2d. Arkansas, Monticello, cotton injured, 2d. Connecticut, Colebrook, 8th. District of Columbia, Washington, 12th. Delaware, Milford, 12th. Georgia, Gainesville, 1st; Atlanta, ice, 2d and 3d. Illinois, Riley (potato and tomato vines killed), 5th; Anna, 12th; Carbondale, ice, 16th. Indiana, Laconia, 7th; Wabash, ice, 8th; Saint Meinrad, ice, 16th. Iowa, Rockford, ice, 1st; Davenport and Keokuk, ice, 7th; Council Bluffs, ice, 11th. Maine, Cornish, 3d; West Waterville, 10th. Massachusetts, Worcester, 12th. Kentucky, Louisville, ice, 15th. Kansas, Dodge City, ice, 1st. Michigan, Litchfield, 5th; Detroit, 9th; Port Huron, ice, 15th. New Hampshire, Auburn, ice, 9th. New Jersey, Freehold and Lindon, ice, 9th. New York, Palermo, ice, 12th. North Carolina, Lenoir, 2d; Attaway Hill and Asheville, 16th. Ohio, Bellefontaine, 4th; Kenton, 8th; Urbana and Cincinnati (Mount Auburn), ice, 9th; Cincinnati, 15th. Pennsylvania, Chambersburg, 9th; Tioga, 12th; Philadelphia and Erie, ice, 15th. Tennessee, Rockwood, 16th. Texas, Gilmer, 16th; Melissa, ice, 17th; Clarksville, cotton-crop injured by frosts. Virginia, Lynchburg, Accotink and Comorn, 12th; Prospect Hill and Hampton (the earliest since 1868), 16th. West Virginia, Morgantown, ice, 12th. Utah, Kanab, 20th (killing vines, &c.).

PRECIPITATION.

Upon Chart No. III is represented the amount of rain-fall and melted snow. The figures 15.87, accidentally printed in Southeastern Florida, belong to Daytona, Volusia County, latitude 29° 13′, longitude 81° 01′. The excess in the South Atlantic and Eastern Gulf States is due to storm No. IV, and the hurricane No. VII; that on the Pacific, to the rainy weather along the coast of Northern California, Oregon, and Washington Territory, from 15th to 22d, and 28th to 31st. In Western Texas the rain-fall was 1.01 inches at Fort Stockton, and 1.27 at Fort Duncan; in Northern Texas, 1.50 at Fort Griffin.

Stations at which *not any rain* fell during the month: Fort Lyon, Colo.; Jackson, Miss.; Sydney Barracks, Nebr.; Fort Concho, Tex.; Camp Brown, Fort Fetterman, and Cheyenne, Wyo.; Mount Solon, Va.; Yuma and Stanwix, Ariz.

First rain-fall of the season.—California, Benicia Barracks, 16th; El Monte, 17th; Vallecitas, 28th.

Heavy rain-falls.—Mayport, Fla., 4.4 inches 7th, 8.2 inches 8th, and 3.0 inches 9th; Quitman, Ga., 11 a. m. 7th to 5 a. m. 11th, 14.25 inches; Daytona, Fla., 1 p. m. 6th, to 9th, 7.18 inches, and 18th, 19th, and 20th, 8.20 inches.

First snow of season.—Massachusetts, Billerica, 15th. Michigan, Fort Wayne, 7th. New York, Albany, 11th; West Point and Brook Haven, 15th; North Argyle, 17th. Rhode Island, Newport, 15th. Maine, West Waterville, 11th. New Hampshire, Shelburne, 11th. Ohio, Hudson, 7th. Pennsylvania, Philadelphia, 15th; Tioga, 28th. Virginia, Norfolk and Richmond, 15th; Vermont, Woodstock and Lunenburgh, 8th; Westminster, 16th. District of Columbia, Washington, 15th,

Total snow-fall.—Pennsylvania, Newcastle, 1 inch. New York, Cazenovia, 6 inches; White Plains, 3 inches. Michigan, Northport, 2.7 inches. Colorado, Summit, 2.3 inches.

Cloudy days.—The number on which the cloudiness has averaged eight-tenths or more, as reported by the volunteer observers, ranges in New England from 5 to 13;

Middle States, 4 to 17; South Atlantic States, 3 to 14; Gulf States, 0 to 15; Ohio Valley, Tennessee, and Arkansas, 4 to 16; Lake region, 6 to 21; Northwest, 3 to 17.

Rainy days.—The number on which a greater or less quantity of rain or snow fell averages as follows in the various districts: Atlantic States, 10; Gulf States, 4; Tennessee, 9; Ohio Valley, 12; Lower Lake region, 19; Upper Lake region, 14; Upper Mississippi Valley, 8; Missouri Valley, plains of Nebraska, Kansas, and Indian Territory and California coast, 7; Oregon, 15; Rocky Mountain stations varies from 3 to 13.

Drought.—Maine, water in Sebago very low, 31st. Massachusetts, water in Watuppa Lake 58¾ inches below high-water mark, probably lowest since 1857. Mississippi, Brookhaven, droughts very severe. New Hampshire, at Shelburne and Dumbarton, wells, springs, and streams low, 31st. New York, Cooperstown, streams and springs low, 31st; Wappinger's Falls, water in lake very low, factory only able to run half-time. Vermont, Woodstock, drought severe; West Charlotte, Lake Champlain, very low, 31st. West Virginia, Salem, very dry, streams low, 31st. Texas, Corsicana, continued droughts (and grasshoppers) have destroyed the stock-ranges, and in some parts of country people are hauling water 10 or 12 miles; no wheat planted, ground too hard to plow. Utah, Kanab, water low in creeks, 2d.

RELATIVE HUMIDITY.

The average relative humidity ranges, for the Atlantic-coast stations, from 67 to 74 per cent.; interior of the Middle and New England States, 64 to 74; South Atlantic States, 68 to 75; Gulf coast, 69 to 77; interior of Gulf States, Tennessee, and the Ohio Valley, 55 to 66; Lower Lake region, 65 to 70; Upper Lake region, 59 to 77; Upper Mississippi Valley, 51 to 65; Missouri Valley, 51 to 63; Minnesota, 65 to 72; plains of Kansas and Nebraska, 54; Rocky Mountain stations, 32 to 71; Pacific coast, 64 to 81. *Moist stations:* Mount Washington averages 91 per cent; Portland, Oreg., 81; San Francisco, 78; Saint Mark's and Alpena, 77; Charleston and Indianola, 75; Cape Hatteras, Smithville, and Albany, 74; Escanaba and Wilmington, 73. *Dry stations:* Denver averages 32 per cent.; Cheyenne, 39; Salt Lake City, 47; Virginia City, 48; Santa Fé, 49; Saint Louis, 51; Bismarck, 53.

WINDS.

Prevailing winds.—The points of the compass from which the winds have blown most frequently are indicated by the arrows, flying with the wind, upon Chart No. II. On Mount Washington they have been from the northwest; Yuma, south; Camp Lowell, Maricopa, and Stanwix, Ariz., west; Campo (west of Yuma), west; Bourne (northwest of San Antonio), Tex., south; Smithville, N. C., southwest.

Maximum velocities.—On the summit of Pike's Peak, northwest, 72, 23d; Mount Washington, northwest, 96, 15th; Santa Fé, west, 38, 19th.

Total movements.—The largest total movements of the wind, independent of direction, have been recorded at the following stations, viz: Pike's Peak, 13,703 miles; Cape May, 12,394; Cape Lookout, 12,084; Sandy Hook, 11,697; Grand Haven, 10,928; Erie, 10,056; Pembina, 9,298; Key West, 9,736; Cape Hatteras, 9,405; Barnegat, 9,062. No continuous record has been obtained for Mount Washington. The following stations report the smallest movements: Lynchburg, 2,385 miles; Portland, Oreg., 2,535; Augusta, 2,755; Nashville, 3,023; Vicksburg, 3,140; Shreveport, 3,334; Salt Lake City, 3,418; Memphis, 3,489; Virginia City, 3,493; Springfield, 3,524.

VERIFICATIONS.

Probabilities.—As worked up three times daily and issued to the public, they have been carefully compared with the actual conditions during the succeeding twenty-four hours, and the following result obtained, viz: the percentage verified, averages 90.1 for New England; 90.1, Middle States; 92.5, South Atlantic States; 88.6, East Gulf States; 87.1, West Gulf States; 91.9, Ohio Valley and Tennessee; 88.5, Lower Lake region; 91.9, Upper Lake region; 91.7, Upper Mississippi Valley; 91.2, Lower Missouri Valley. The average is 92.8 per cent. for the weather; 90.1, wind direction; 91.1, temperature; 87.7, barometric changes. For the whole country, the average verified is 90.4 per cent. There were 4 omissions to predict out of 3,720, or 0.1 per cent.

Cautionary signals.—They were ordered to be displayed at 167 stations along the Lakes and Atlantic and Gulf coasts. Of these, 120 were justified; 3 lowered too soon; 1 displayed late. Out of 47 not justified, 20 were ordered during the advance of the hurricane, No. VII, viz: 5 along the Gulf coast before it was certain what course it would pursue, and 15 from Virginia to Maine, to prevent vessels from running into it. There were 55 cases reported, generally from scattered stations, in which the wind-velocity reached 25 miles and over, per hour, without the display of signals. To the Canadian stations 52 warnings have been sent, but with what result is not known.

NAVIGATION.

Height of rivers.—Upon Chart No. III is a table giving the highest and lowest water-marks, with the dates upon which they occurred. The highest water at Nashville on the 25th was 3 feet 11 inches, the figures in the table being in error. At Pittsburgh, navigation in general suspended on account of low water, 21st; 31st, a few boats left, but the slight rise was not sufficient for a resumption of navigation.

TEMPERATURE OF WATER.

As heretofore, the maximum and minimum temperatures alone, with the average depth of the water, are given in the table on Chart No. II.

ATMOSPHERIC ELECTRICITY.

Thunder-storms.—The dates, states, accompanied by hail, and number of stations, when more than one, in each, are as follows: First, Alabama, California, Illinois, Nevada, New York; 4th, New York, Tennessee, Texas; 5th, Iowa, 2, Michigan, Minnesota, Texas; 6th, Massachusetts; 7th, Florida, Maine; 8th, Arizona; 9th, Michigan, 2; 10th, Colorado, New Mexico; 11th, Arizona, Idaho, Montana Territory, Nevada, Utah; 12th, Arizona, Utah, 2; 13th, Illinois, Kansas, 2, Michigan, Missouri, Nebraska, 3; 14th, Maryland, 2, Pennsylvania, Texas; 15th, New Jersey, 2, Utah; 17th, Oregon, Utah; 18th, Indian Territory, Louisiana, 2, Mississippi, Oregon, Texas, Utah; 19th, Arkansas, Illinois, 2, Indian Territory, hail, Kansas, 5, Oregon; 20th, Indiana, Iowa, 2, Michigan, Mississippi, 2, Missouri, Ohio, Wisconsin, 2; 21st, Arkansas, Indiana, Kentucky, Louisiana, Oregon, Tennessee, 2, Texas; 22d, Alabama, Ohio, 2, Pennsylvania, 2, Tennessee, 2; 24th, Tennessee; 25th, Maine; 26th, Wisconsin; 27th, Indiana, Kansas, Kentucky, Michigan, hail, 6, Ohio, 3, Texas, Wisconsin; 28th, California, Illinois, hail, 4, Indiana, 7, Iowa, Michigan, hail, 4, Ohio, 10, Pennsylvania, 2; 29th, Illinois, 4, Indiana, 5, Iowa, 2, Kentucky, 2, Ohio; 30th, Illinois, 2, Indiana, Kansas, Michigan; 31st, Illinois, 6, Indiana, hail, 2, Iowa, 3, Kansas, hail, 8, Michigan, hail, 4, Missouri, New York, 2, Ohio, 2, Texas, Wisconsin, 2.

Auroras.—Fifth, Lunenburgh, Vt.; 6th, Vevay, Ind., Strafford, Vt.; 8th, Spiceland, Ind.; 9th, Saint Paul, Minn.; 10th, Monticello, Iowa, Woodstock, Vt., Buffalo and Malone, N. Y., Bismarck and Pembina, Dak., Duluth and Saint Paul, Minn., Port Huron, Mich.; 11th, Afton, Iowa, Toledo, Ohio; 12th, Auburn, N. H.; 13th, Rockford, Iowa; 16th, Malone, N. Y.; 17th, Fort Brady, Mich., Buffalo, N. Y.; 18th, Nora Springs, Iowa, Vallecitas, Cal; 19th, Lunenburgh, Vt.; 20th, Malone, N. Y.; 25th, Rocky Run, Wis.; 26th, New York City.

OPTICAL PHENOMENA.

Solar halos.—First, Kansas; 2d, Tennessee; 3d, Ohio, Tennessee; 4th, Kansas, Ohio, Wisconsin, Illinois, Colorado, Rhode Island; 5th, Illinois, Maine, Ohio, South Carolina, Michigan, New Hampshire; 6th, Tennessee, South Carolina, Wyoming Territory, Colorado, North Carolina; 7th, Georgia, North Carolina, Tennessee; 8th, Maryland, Tennessee, New Jersey; 9th, Illinois, New York, Virginia, New Jersey, Tennessee; 10th, Colorado, Delaware, Massachusetts, New York, Virginia, New Jersey, North Carolina, Rhode Island, New Hampshire; 11th and 12th, New York; 13th, Iowa, Kansas, Michigan, New Hampshire, Minnesota, New York; 14th, Louisiana, Mississippi; 16th, Wyoming, Colorado, New York, California; 17th, Georgia, Iowa; 19th, Ohio; 20th, Maine, Massachusetts, New Hampshire, Rhode Island; 21st, Michigan, Rhode Island; 23d, California; 25th, Nebraska, Wisconsin, Minnesota; 26th, Tennessee, California; 27th, Illinois, Iowa, North Carolina, Tennessee, Wisconsin, Colorado; 28th, Illinois, New York, Ohio, Tennessee; 29th, Tennessee, New York; 30th, Illinois, New Hampshire, Tennessee, New York; 31st, Tennessee.

Lunar halos.—First, Iowa, New York, Ohio, Wisconsin, Connecticut, North Carolina; 2d, Illinois, Iowa, New York, North Carolina, Tennessee, Alabama, Connecticut, Pennsylvania, Missouri, Oregon; 3d, Iowa, Dakota, Florida, Pennsylvania, Alabama, Connecticut, North Carolina, Ohio; 4th, Colorado, Iowa, Nebraska, Ohio, North Carolina, District of Columbia, California; 5th, Maine, Mississippi, New Hampshire, New York, Ohio, Tennessee, Alabama, District of Columbia; 6th, Georgia, North Carolina, South Carolina, Tennessee, Maine, Alabama, New Mexico; 7th, Georgia, North Carolina, Tennessee, Virginia; 8th, Illinois, North Carolina, New Jersey; 9th, New Jersey, Virginia; 10th, Georgia, Kentucky, New York, West Virginia, District of Columbia; 12th, Illinois; 16th and 17th, Illinois; 18th, Kentucky; 21st, Kentucky, Tennessee; 24th, Kentucky, Nebraska, Maine, Missouri, North Carolina, New Jersey; 25th, Illinois, Missouri, North Carolina; 26th, Iowa, New Hampshire, Wisconsin, Minnesota, North Carolina; 27th, Illinois, Iowa, Massachusetts, Michigan, New Hampshire, New York, Ohio, Pennsylvania, Tennessee, Wisconsin, Dakota, Maine, Indiana, Connecticut, New Mexico, Louisiana, North Carolina; 28th, Illinois, Indiana, Massachusetts, Ohio, Tennessee,

Dakota, Maine, Kentucky, Alabama, North Carolina; 29th, Iowa, New York, Ohio, Tennessee, Georgia, Kansas, Maine, Indian Territory, Alabama, Missouri, North Carolina; 30th, Colorado, Illinois, Tennessee, Indian Territory, Alabama, Connecticut, Missouri, North Carolina, Rhode Island; 31st, Illinois, Michigan, Nebraska, New Jersey, Ohio, Tennessee, Indian Territory, Indiana, Alabama, Louisiana, North Carolina, Mississippi.

Mirage.—Fort Yuma, Cal., 6th; Golden, Colo., 25th; Great Bend, Kans., 1st, 6th, 15th, 23d, 24th, and 25th; Sedgwick, Kans., 23d; Breckenridge, 13th, 15th, and 16th; New London, 13th and 19th.

MISCELLANEOUS PHENOMENA.

Zoological.—Wild geese were observed flying southwest at Cincinnati, on the 31st; Charleston, south, 14; Corsicana, south, 12th and 13th; Breckenridge, south, 7th; Dubuque, south, 11th and 13th; Fort Gibson, south, 10th, 14th and 30th; Morgantown, south, 27th; Shreveport, south, 13th; Sandy Hook, south, 14th; Washington, south, 4th and 10th, east 14th; Fort Randall, Dakota, south 3d and 21st; Lower Brulé agency, Dakota, south, 19th and 25th; Fort Hartsuff, Nebr., south, 27th; Carbondale, Ill., southwest, 4th; Laconia, Ind., south, 12th; Saint Meinrad, Ind., south, 14th; Wabash, Ind., south, 25th; Afton, Iowa, south, 3d and 12th; Monticello, Iowa, south, 11th; Le Roy, Kans., south, 3d; Great Bend, Kans., south, 20th; Bennettsville, Ky., south, 14th; Somerset, Mass., south, 12th; Fall River, Mass., south, 31st; Brookhaven, Miss., south, 16th; Plattsmouth, Nebr., south, 1st; Carson City, Nev., south, 12th and 13th; Waterburg, N. Y., south, 28th; Palermo, N. Y., southwest, 11th; Attaway Hill, N. C., south, 12th and 13th; Bellefontaine, Ohio, south, 31st; Carthagena, Ohio, south, 7th and 14th; Jacksonburgh, Ohio, south, 11th; Tioga, Pa., south, 22d; Franklin, Pa., southeast, 30th; Emporium, Pa., south, 8th and 14th; Belmont Farm, Tex., south, 3d, 8th, and 21st; Gilmer, Tex., south, 4th; Kanab, Utah, south, 2d; Prospect Hill, Va., 13th; Accotink, Va., south, 11th; Embarrass, Wis., south, 9th, 10th and 11th; Wautoma, Wis., 16th; Utica, Wis., south, 9th, 17th and 18th. *Wild ducks*, flying north, at Nashville, 4th; Cape Hatteras, south, 28th; Fort Brady, Mich., south, 6th; Golden, Colo., southeast, 12th; Fort Madison, Iowa, north, 16th; Jacksonburgh, Ohio, south, 27th; Monticello, Iowa, 24th. *Brants*, seen at Fort Madison, Iowa, 1st and 11th; abundant at Great Bend, Kans., 12th. *Cranes*, seen at Fort Madison, Iowa, 24th; flying south at Breckenridge, 7th; Le Roy, Kans., south, 12th; Great Bend, Kans., south, 18th; Belmont Farm, Tex., south, 13th. *Snowbirds* seen at Eastport, 8th; Bethel, Ohio., 27th and 28th. *Blackbirds*, seen at Wautoma, Wis., 25th; flying south at Dubuque, 22d; Palermo, N. Y., southwest, 7th. *Bluebirds*, flying south, at Monticello, Iowa. 9th; Wappinger's Falls, N. Y., large flocks south, 1st. *Swallows*, last seen at Carthagena, Ohio, 3d. *Robins*, last seen at Tioga, Pa., 20th; West Charlotte, Vt., 19th; numerous at Stratford, Vt., 17th. *Meadow-larks*, seen at Wautoma, Wis., 15th. Charleston, S. C., visited by several species of strange birds on 31st. *Grasshoppers* were reported numerous at Cincinnati on the 22d; a few flying southeast at Cheyenne, 3d; numerous at Corsicana, 3d to 5th, disappearing about 9th; abundant at Belmont Farm, Tex., 1st to 9th; numerous and destructive at times during month at Le Roy and Baxter Springs, Kans.; reported nearly all gone at Creswell, Kans., 19th, and Council Grove, Kans., 31st; flying northeast at Golden, Colo., 2d; summit of mountains near Denver covered with many thousand bushels of dead grasshoppers.

Meteors.—6th and 7th, Waterburg, N. Y. 8th, Somonauk, Ill.; Standish, Me.; Somerset, Boston, and Wilbraham, Mass.; Brookhaven, Miss.; Westminster, Vt.; New London, Conn. 9th, Wabash, Ind. 10th, Monticello, Iowa; Great Bend, Kans.; Bennettsville, Ky.; La Crosse, Wis. 11th, Gardiner, Me.; Woodstock, Md.; Buffalo, N. Y. 12th, Woodstock, Md. 13th, Woodstock, Md.; Florida, Mass. 14th, Mayport, Fla; Afton and Davenport, Iowa; Corning, Mo.; Cape Lookout, N. C. 15th, Wabash, Ind. 16th, Monticello, Iowa; Woodstock, Md.; Brookhaven, Miss.; Corning, Mo.; Freehold, N. J. 17th, Wabash, Ind.; Florida, Mass. 18th, Durham, Ark.; Bennettsville, Ky.; Woodstock, Md.; Northport, Mich.; Waterburg and Hector, N. Y.; Salem, W. Va.; Indianapolis, Ind. 19th, Woodstock, Md.; New Bedford, Florida, and Fall River, Mass.; Urbana and Wooster, Ohio; Westminster, Vt.; Wautoma, Wis.; New York City; Newport, R. I. 20th, Golden, Colo.; Woodstock, Md.; Waterburg, N. Y.; New London, Conn. 21st, Golden, Colo.; Wabash, Ind.; Benettsville, Ky.; Mount Auburn, Ohio; Jacksonville, Fla. 22d, Corning, Mo; Charleston, S. C. 23d, Saint Louis, Mo. 24th, Golden, Colo.; Afton, Iowa; Benettsville, Ky.; Springfield, Mass. 25th, Monticello, Iowa. 26th, Standish, Me. 27th, Fall River and Springfield, Mass. 28th, Wabash, Ind.; Fall River, Mass.; Emerson, Nebr. 29th, Le Roy and Great Bend, Kans. 20th, Somonauk, Ill.; Jacksonville, Fla.; Saint Louis, Mo. 31st, Aiken, S. C.; Augusta, Ga.

Earthquakes.—Severe shock felt at San Francisco, 9.20 p. m. 6th, lasting about ten seconds, motion from northwest to southeast; a second and lighter shock at 10.03 the same day. The former was also felt at Oakland, San José, and Angel Island, Cal., with an oscillatory motion.

Prairie fires.—Seen from Pike's Peak, 1st, 28th; Pembina, 1st, 14th, 15th, 22d, 23d, 24th, 25th, 26th, 30th; Creswell, Kans., 5th, 29th; Lake Charles, La., 8th, 14th; Breck-

enridge, 8th, 9th, 14th, 15th, 16th, 17th, 18th, 19th, 27th, 31st; Bismarck, 9th, 13th, 28th 29th, 30th, 31st; Lower Brule agency, Dakota, 15th; in West Township, McLean County, Ill., one thousand acres burned over, four hundred acres of corn destroyed, 19th; Genoa, Nebr. (south and west), 31st.

Icebergs.—Latitude 45° 42′ north, longitude 49° 13′ west, 1st; 46° 10′ north, 50° west, 4th.

Polar bands.—Wisconsin, Milwaukee, 1st. Ohio, Carthagena, 3d, 5th, 13th, 16th, 18th, and 21st. Virginia, Wyethville, 7th. Kentucky, Benettsville, 7th and 8th. District of Columbia, Washington, 8th. Iowa, Guttenberg, 8th, 16th; Iowa City, 8th, 17th; Nora Springs, 8th, 26th; Tabor, 28th. Mississippi, Fayette, 20th, 23d. New Jersey, Freehold, 29th. Tennessee, Nashville, 29th.

Published by order of the Secretary of War.

ALBERT J. MYER,
Brig. Gen. (Bvt. Assigned), Chief Signal-Officer, U. S. A.

PAPER 30.

MONTHLY WEATHER REVIEW, NOVEMBER, 1876.

INTRODUCTION.

In compiling the present review, use has been made of the meteorological data reported from 424 stations, classified as voluntary observers, Army post and signal-service stations. But few prominent features are noticeable in the meteorology of the month; an excess of rain is reported from the Upper Lake region, New England, and the Middle Atlantic States, with temperatures decidedly above the average, being, in some portions, the warmest November recorded for forty years. Remarkable storms have not occurred within the United States, but severe gales and hurricanes seem to have prevailed over the North Atlantic.

BAROMETRIC PRESSURE.

In general.—The barometric pressure is shown, as usual, by the isobars on Map No. II, The area of highest average pressure is there shown to be central in the Lower Mississippi Valley, while the average is almost equally high at Pembina. The lowest isobar, 29.90, passes northeastward through Nova Scotia and Cape Breton. As compared with the previous month the pressure has risen decidedly in the Lake region, the Southwest, and Southern Florida. As compared with November, 1875, the barometer has been higher in the Southwest and Northeast, but lower in the Lakes, Ohio Valley, and Middle States. As compared with November, 1874, the pressure has been very generally lower, and especially so in the Middle and Eastern States. As compared with November, 1873, the pressure has been lower in New England and probably the Canadian provinces.

Areas of high barometer.—The principal areas of high barometer have been as follows:

No. I.—On the 2d the pressure rose in the Southwest with northerly gales, and the central highest barometer continued thereafter slowly moving northeastward, reaching Ohio on the afternoon of the 4th, and New Hampshire by 11 p. m. of the 5th, finally disappearing on the 6th over the Gulf of Saint Lawrence and Cape Breton, where the pressure remained very high during the 7th, having been re-enforced by colder air from the north and east.

No. II. Central on the 7th in Texas, having moved thither during the 6th, whence it moved slowly eastward, reaching Georgia on the 10th and remaining in Georgia and Florida until the 13th.

No. III. Advanced on the 12th southward from Manitoba, and was, 11 p. m. of the 13th, apparently central over Eastern Dakota, by which time, also, northerly gales had begun on the Texas coast. By the morning of the 15th the remaining small area of high pressure was central in Indian Territory, and by the morning of the 16th an additional flow of air southward over the Lakes seems to have given rise to a ridge of high pressure, extending from Texas northeastward over the Saint Lawrence Valley. The barometer continued high over Canada and New England until the 20th.

No. IV. The northerly winds following low barometer Nos. VIII and IX had, by 11 p. m. of the 17th, extended southward to Kansas, and to the Texas coast by the 18th, at 4.35 p. m. On the morning of the 19th a ridge of high pressure extended from Manitoba to Texas, which, by 4.35 p. m., had contracted to a small area, central in Arkansas, whence it moved eastward over the Gulf States, separating the areas of low pressure Nos. IX and X.

No. V.—The cold northerly winds following low barometer No. X had, by midnight

of the 21st, extended southward over the Texas coast, and the succeeding area of highest pressure extended, at 11 p. m. of the 22d, over Arkansas and the Lower Missouri Valley, and, on the morning of the 23d, was confined to Arkansas, whence it extended eastward, being, on the morning of the 24th, central in Eastern Tennessee, after which, however, being re-enforced from the West, the highest pressure remained in Texas.

No. VI.—From the 22d to the 25th the pressure was high on the Pacific coast, while low barometer No. XIV was apparently passing southeastward through Manitoba. On the 27th, in the morning, rising barometer, with colder northerly winds, was reported in Dakota. By the morning of the 28th the pressure had risen west of the Lake region, with lower temperatures but light winds. By morning of the 29th decidedly colder northerly winds prevailed in Oregon, Montana, and Dakota, which by the morning of the 30th extended over the Mississippi Valley and Lake region, and westward to Rocky Mountain stations. The highest pressure reported at this time was 30.97 in Manitoba. At 11 p. m. the isobar 30.90 inclosed an elongated area extending from Yankton to Pembina, and during the 1st of December isobars retained their positions nearly parallel to their meridian, while the highest barometer remained in the extreme Northwest. The high northerly winds attending this great area of high barometer prevailed on the 30th over the whole of the Gulf of Mexico.

Areas of low barometer.—The areas of low barometer during the month have not developed into any storms of remarkable severity, the only ones at all notable are those numbered I, II, VII, and IX, and the "norther" of the 29th and 30th on the Gulf of Mexico. In the number and character of the storm-tracks, this month resembles November, 1873, and 1875; the tracks of the storms of November, 1874, seem to have lain farther north and west. The average velocity of the fifteen depressions recorded on map No. I is 22½ miles per hour, while the fourteen depressions of November, 1875, averaged 32 miles.

No. I.—This depression, which began on the 30th of October, was on the morning of the 1st of November apparently central in Southeastern Kansas; it extended rapidly northeastward and maintained an elongated oval contour, while it also moved bodily northeastward over Lake Huron, and disappeared in Canada on the morning of the 3d. The rain or snow-fall attending its progress was principally confined to its northern side. High northerly winds were reported on the coasts of Texas on the morning of the 2d, and on the lakes later in the day.

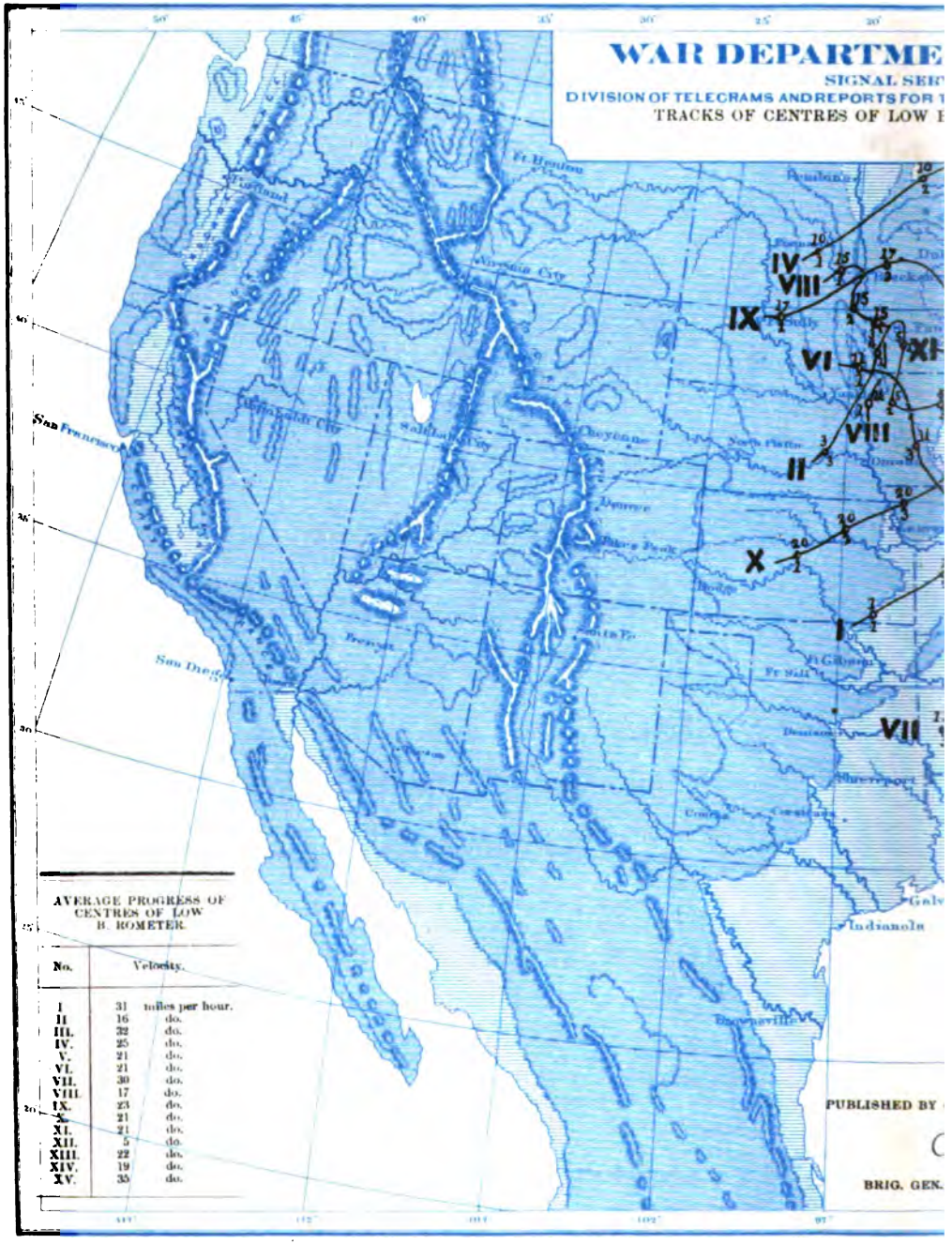
No. II.—The preceding depression was followed on the 3d by rising barometer and southerly winds over the northwest and southwest, which, being met in Dakota and Minnesota by cold northerly winds and rising barometer, gave rise to a slight depression, with cloud and snow, which developed slowly during the 3d and 4th, and on the afternoon of the 5th extended as a much-elongated oval from Minnesota to Indian Territory, while warm southerly winds, cloudy weather, and light rain prevailed from the Gulf coast northward over the Upper Lakes. The storm-center now moved more rapidly northeastward, with an increasing central depression, which, on the afternoon of the 6th, was central in Northern Michigan, at which time southeast winds and rains prevailed on Lake Ontario, south and southwest winds, with rain and snow, on Lakes Erie and Michigan, and cold north or northwest winds, with clear weather, from Manitoba to Texas. Brisk winds, increasing to gales, prevailed on the Texas coast and Lower Lakes at midnight of the 6th and morning of the 7th.

No. III.—This depression apparently formed during the 7th, off Cape Hatteras, where warm southerly winds (apparently due to low barometer No. II) were met by the cold, northerly winds, due to the very high barometer that was formed east of Nova Scotia while No. II was approaching the Saint Lawrence Valley. The exact track of No. III is quite uncertain, but it appears, on the morning of the 8th, to have passed between Maine and Nova Scotia, and to have been over the Gulf of Saint Lawrence on the afternoon of the 9th.

No. IV.—The falling barometer that prevailed during the 9th in Manitoba and Dakota, indicated the approach of the low barometer, whose center was, on the morning of the 10th, a little west of Minnesota, whence it moved northeastward into British America, and is lost sight of in the very general depression which immediately followed.

No. V.—This depression was, probably, on the morning of the 10th a very considerable distance east of the Middle Atlantic Coast. At midnight of the 10th it lay between Massachusetts and Nova Scotia, where it perhaps continued until the morning of the 12th. The afternoon and midnight maps of the 12th show that it remained central near the Bay of Fundy, after which it moved eastward, and was probably entirely broken up.

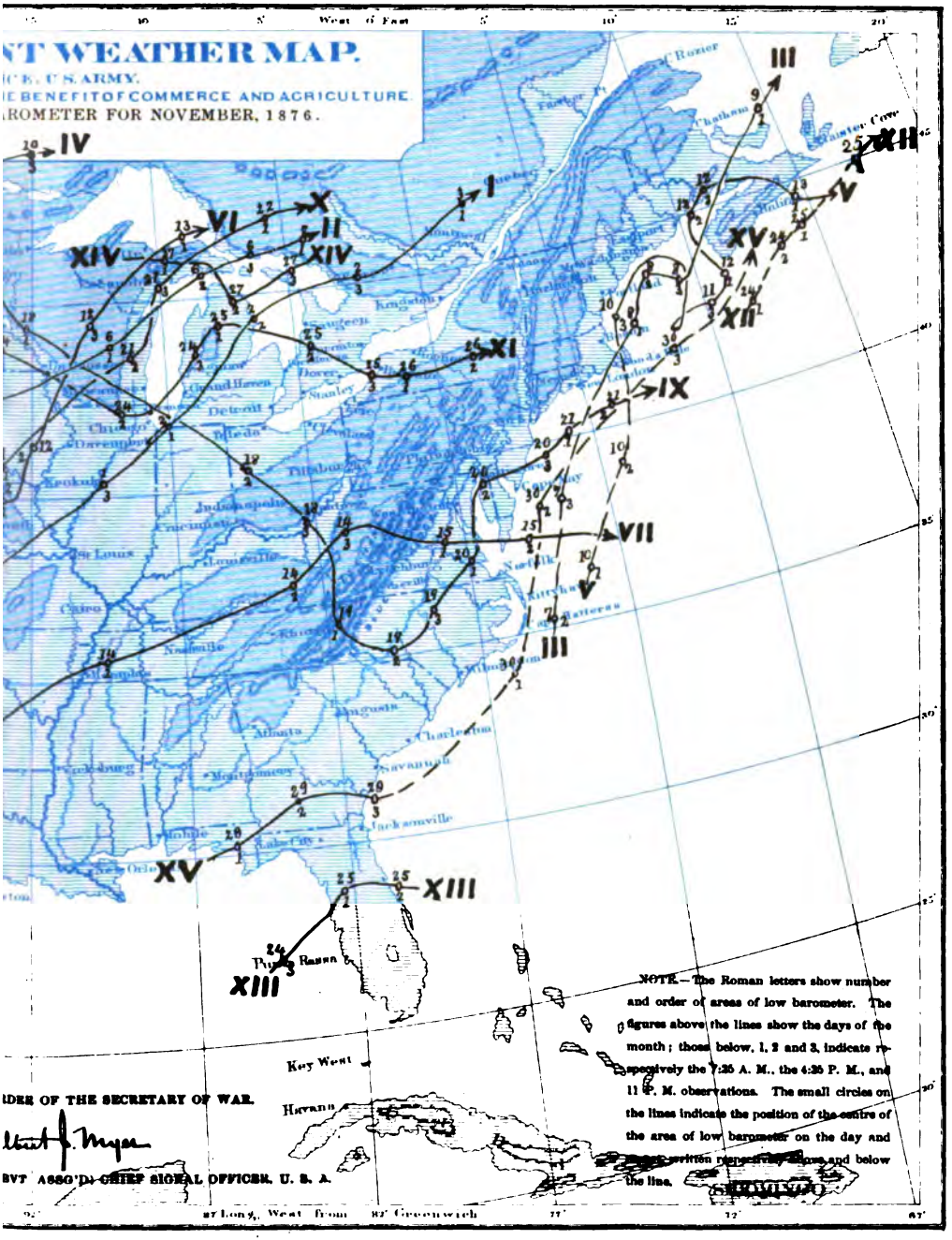
No. VI.—The cold northerly winds following area No. IV, as they extended southward into Kansas, gave rise to depression No. VI, which extended on the morning of the 11th northeastward through Eastern Nebraska, after which it turned southward through Iowa until it was, on the morning of the 12th, central in Northern Missouri, when it turned northeastward over the lakes, and on the 13th disappeared in Canada, producing a very general depression, with warmer, southwest winds over the Lower



AVERAGE PROGRESS OF CENTRES OF LOW BAROMETER.

No.	Velocity.
I.	31 miles per hour.
II.	16 do.
III.	32 do.
IV.	25 do.
V.	21 do.
VI.	21 do.
VII.	30 do.
VIII.	17 do.
IX.	23 do.
X.	21 do.
XI.	21 do.
XII.	5 do.
XIII.	22 do.
XIV.	19 do.
XV.	35 do.

No. I.



DER OF THE SECRETARY OF WAR.

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Lakes and Saint Lawrence Valley, and followed by an area of very high pressure over the Northwest, Southwest, and Upper Lakes.

No. VII.—On the morning of the 13th, while the preceding low barometer was in Canada, the extensive area of warm southerly winds over the Gulf States was sharply bounded on the west by the advancing southern edge of cold northerly winds; and on the afternoon of the 13th a belt of unusually strongly-contrasted temperatures and opposing north and south winds extended from Southern Texas to the Ohio Valley. In this region was developed storm-center No. VII, which advanced during the 14th northeastward to the Ohio Valley and West Virginia, while northerly gales prevailed on the Texas Coast. During the 15th the center of low barometer moved eastward over the Middle Atlantic coast, while an area of high pressure advanced southward over the Saint Lawrence Valley and Lower Lakes to the Alleghanies.

No. VIII.—The low barometer which prevailed on the 14th in Oregon was followed by a depression apparently central on the morning of the 15th in Dakota, whence it moved slowly southward, and disappeared on the 16th in the Missouri Valley.

No. IX.—This depression is first definitely located on the afternoon of the 17th, although it may also be looked upon as a continuation of the previous area of low barometer. At midnight of the 17th the depression was central in Minnesota, with rapidly rising barometer and cold northwest winds, with snow, to the westward. The depression at first extended somewhat northward, but on the 18th moved rapidly in an unusually well-marked southeast direction into North Carolina, where it remained during the 19th, while an area of high pressure moved southward over New England. Cold easterly winds, with rain, prevailed from the 17th to 20th, inclusive, over the Middle Atlantic States, after which winds backed to northerly and the barometric depression moved northeastward until it disappeared on the 21st east of New England.

No. X.—The warm southerly winds that, on the 19th and 20th, advanced northward to the Gulf States, were met by cold northerly winds in Kansas and Nebraska, where low barometer No. X had its origin, and whence it moved northeastward, being on the morning of the 21st central in Eastern Iowa, and disappearing on the 22d north of Lake Huron. This storm was accompanied on the 21st and 22d by rain and snow, with high winds at most stations on the Lakes.

No. XI.—The map of November 23d, 11 p. m., shows that warm northwest winds were prevailing in the higher portions of Western Kansas, Nebraska and Dakota, while southerly winds, having much lower, but rapidly rising, temperatures, prevailed at the lower stations to the eastward in Minnesota, the Upper Mississippi and Lower Missouri Valleys. As a consequence of this overflow of warm westerly winds the morning map of the 24th shows a slight depression central in Minnesota, which moved eastward over Lake Michigan, and disappeared on the 26th among the mountains of the Middle States.

No. XII.—On the 24th a depression appears near Nova Scotia, and evidently northeastward some distance from the coast, until on the afternoon of the 25th it was east of Cape Breton, where it appears to have remained nearly stationary during the 26th.

No. XIII.—An indefinite depression appears on the 24th and 25th to have moved northeastward over Southern Florida. High winds prevailed for a short time at Punta Rassa and Key West.

No. XIV.—A third indefinite depression appears on the morning of the 27th in the Lake region, having moved southward, but apparently owing its existence to the very general light snows that prevailed. The low barometer that, at the same time, prevailed over the Gulf of St. Lawrence, extended westward, and these two appear to have merged into one on the 28th.

No. XV.—The low barometer that prevailed over Canada and the Gulf of St. Lawrence from the 26th to the 29th was attended by a gentle flow of air southward over the Gulf States on the 27th, on which date a slight depression, with increasing cloudiness, began to form on the Gulf coast, and moved eastward on the 28th and over Georgia on the 29th, its track being along the northern limit of the southerly winds prevailing over Florida and the Gulf of Mexico. It was central on the afternoon of the 29th in Georgia, with a rapidly increasing area of cloud and rain. On the morning of the 30th it was central near Cape Hatteras, where the central barometer had decidedly fallen, while west of the Alleghanies the pressure had risen, being as high as 30.97 in Manitoba, and high northerly winds had extended southward to the West Gulf coast. During the rest of its course this storm-center remained a short distance east of the Atlantic coast, but the area of cloud and snow extended over the greater part of the country east of the Mississippi, and the area of cold, high northerly winds which had reached Key West on the afternoon of the 30th was reported to have extended, with unusual severity and heavy rains, southward to the coast of Mexico, Central America, and Isthmus of Darien.

Local storms.—1st, at Fort Sill, I. T., heavy storm of wind and hail; 11th, violent snow-storm at Fort Pierre, Dak.; 19th, gales at Kensico, N. Y.; 19th and 20th, southeast to northeast gales at Flushing, N. Y.; 22d, very heavy ocean swell reported for the past few days at Mt. Desert, Me.; 26th, severe wind-storm at Boulder City, Col.;

30th, severe northwest wind prevailed on Lake Erie, doing considerable damage to shipping; high wind and snow at Gainesville, Ga.

Storms encountered by vessels at sea have been reported as follows: On the 4th and 5th, 41° 10′ north, 59° 30′ west, barometer 29.30; on the 4th, a gale on the Gulf of Lyons, also a hurricane 24° 30′ north, 59° 48′ west; on the 7th, heavy "norther" 24° 19′ north, 90° 09′ west; on the 8th, terrific west-northwest gale, lasting two days, 32° 22′ north, 32° 22′ west; 9th, heavy south gale 38° 25′ north, 68° 05′ west; 10th, southeast gale 49° north, 9° west; 19th, severe northeast gale 26° 30′ north, 47° west, also heavy gale, lasting two days, 35° 20′ north, 59° 25′ west; 20th, heavy sea 43° 12′ north, 66° 18′ west, also heavy rain-squall 34° 32′ north, 73° 52′ west; 21st, heavy northwest gale 51° south, 76′ west; west-southwest hurricane experienced by Bark Britannia, from Pernambuco, when midway between Cape Hatteras and New York.

TEMPERATURE OF THE AIR.

In general.—The general distribution of the temperature for the month is shown by the isotherms on Chart No. II, from which it appears that the temperatures have been above the average in the Ohio Valley, Lake region, Middle and Eastern States, and the St. Lawrence Valley, but have been slightly below the average in the South Atlantic and Gulf States, and decidedly below, west of the Upper Mississippi Valley.

Maximum temperatures.—The maximum temperatures above 80° have been as follows: Cape Henry, 81°; Galveston, 82°; Indianola, 81°; Jacksonville, 82°; Vicksburg, 80°; Wilmington, 81°; Boerne, Tex., 81°.

Minimum temperatures below zero are reported as follows: Bismarck, —15°; Breckenridge, —23°; Cheyenne, 0°; Duluth, —7°; Mount Washington, —10°; North Platte, —3°; Pembina, —34°; Pike's Peak, —17°; Yankton, —7°.

Ranges of temperature.—The largest temperature ranges have been: Albany, 61°; Boston, 69°; Bismarck, 82°; Breckenridge, 83°; Cheyenne, 69°; Denver, 73°; Dodge City, 69°; Duluth, 62°; Keokuk, 60°; Leavenworth, 62°; North Platte, 82°; Omaha, 67°; Pembina, 98°; Saint Louis, 62°; Yankton, 83°. The least ranges have been: Cape May, Grand Haven, New London, New Orleans, and Milwaukee, 40°; Escanaba, 37°; Cape Hatteras, Cape Lookout, Newport, Salt Lake City, and Thatcher's Island, 39°; San Diego, 36°; and San Francisco, 20°.

Frosts.—The principal frosts reported during the month have been as follows; generally only the first frost or heavy frosts are here enumerated: 2d, California; 7th, Mississippi; 8th, Alabama and Georgia; 9th, Alabama, Georgia, and Florida; 10th, Alabama and Florida; 11th, Alabama and Florida; 12th, Florida, California, and Iowa; 19th, Texas; 20th, Alabama and Florida; 21st, Alabama, Florida, Louisiana, and Mississippi; 22d, Florida; 24th, Tennessee; 26th, Alabama, Florida, Georgia, and North Carolina; 27th, Florida and North Carolina; 28th, Texas; 30th, Iowa.

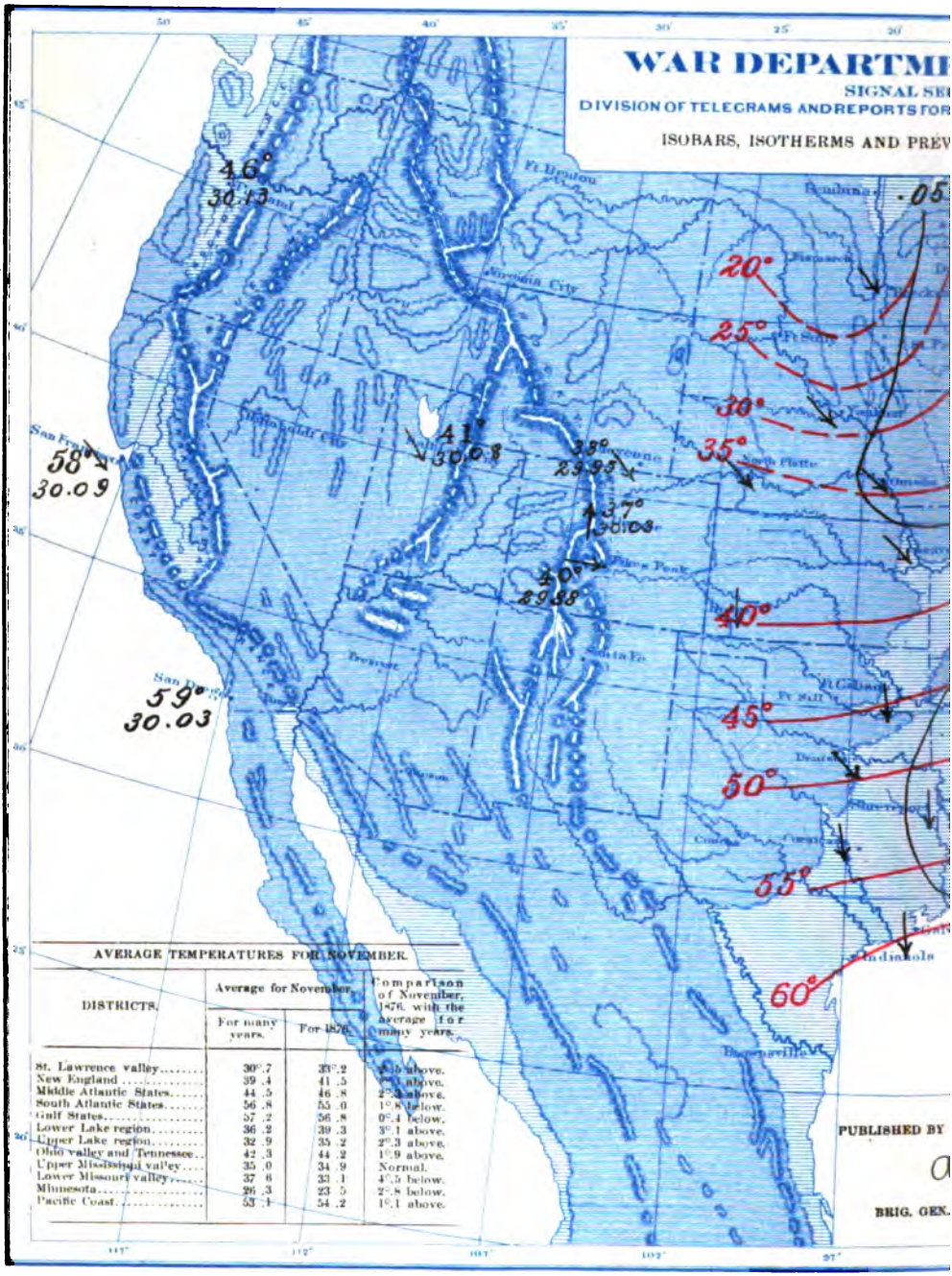
PRECIPITATION.

The general distribution during November of the total amount of rain or melted snow is shown upon Chart No. III, from which it appears that the heaviest rains are reported from Oregon and points near the coast in southeastern New England and the Middle Atlantic States. As compared with November, 1875, the rain-fall in Oregon has decidedly diminished, being but 10 inches this year at Portland, as compared with 15.75 inches last year. At San Francisco, the rain-fall of this year is 0.25 inches, as compared with 0.27 inches for November, 1875. The very large excess that fell in November, 1875, in the Gulf States and the Ohio Valley, is this year followed by a decided deficiency. The deficiency then reported in the Upper Lakes, Upper Mississippi and Lower Missouri Valleys, is now followed by a slight excess. Areas of little or no rain are reported in the South Atlantic States, and in portions of Mississippi, Missouri, Arkansas, and Tennessee.

Light rains.—Stations reporting rain-falls of 0.25 inches or less are as follows: Arizona, Stanwix, 0.06; Camp Verde, 0.15. California, Point San José, 0.19; Salinas City, 0.05; San José, 0.09; El Cajon, 0.14; San Diego, 0.04; San Francisco, 0.25; Colorado, Fort Garland, 0.24; Minnesota, Breckenridge, 0.02; Montana, Virginia City, 0.20; Nebraska, Fort Hartsuff, 0.04; Nevada, Carson City, 0.02; Wyoming, Fort Bridger, 0.18.

Heavy rains.—Stations reporting heavy rains are as follows: Massachusetts, Boston, 2.44 inches 7th, 6.16 inches 20th and 21st, and 11.73 inches total for month; Wood's Holl, 2.5 inches 7th, 2.73 inches 20th and 21st, and 11.70 inches total for month; Fall River, 5.5 inches 7th to 12th, and 5.3 inches 20th to 22d; Pennsylvania, Philadelphia, 4.72 inches 19th and 20th; Delaware, Dover, 7.58 inches 18th to 20th.

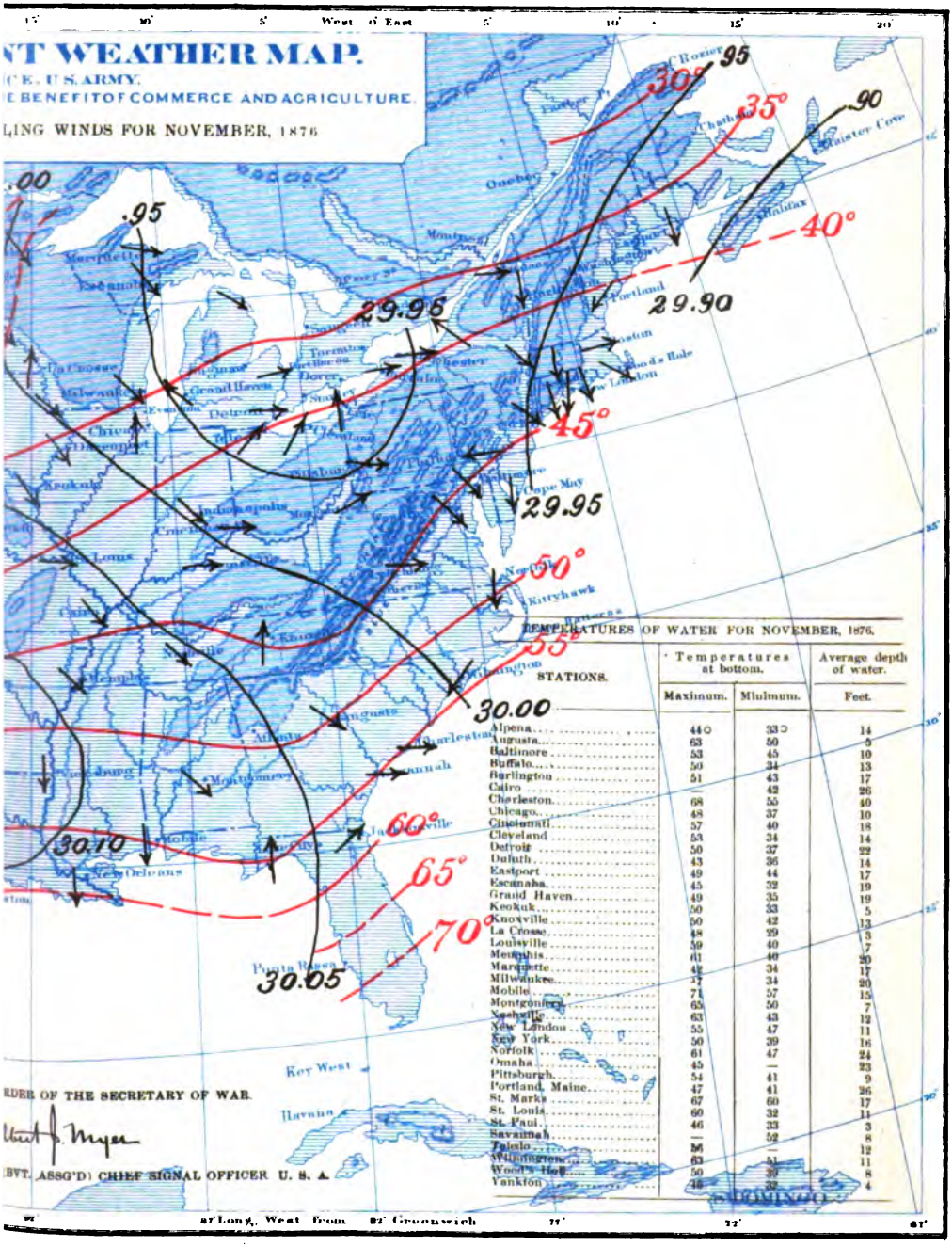
The first snows of the month: First, Iowa, Nebraska; 6th, Illinois, Iowa; 7th, Indiana, Iowa; 8th, Ohio, East Tennessee, and East Michigan; 10th, West Pennsylvania and New York; 13th, Kansas, Missouri; 14th, Kansas; 17th, New York; 19th, Kentucky, Tennessee; 20th, Vermont, Salt Lake City; 23d, Ohio; 24th, Middle States; 25th, Middle States, Maine; 26th, Middle States, Maine; 27th, Southern New England; 30th, Virginia.



AVERAGE TEMPERATURES FOR NOVEMBER.

DISTRICTS.	Average for November.		Comparison of November, 1876, with the average for many years.
	For many years.	For 1876.	
St. Lawrence valley	30°.7	33°.2	2°.5 above.
New England	39 .4	41 .5	2°.1 above.
Middle Atlantic States	44 .5	46 .8	2°.3 above.
South Atlantic States	56 .8	55 .0	1°.8 below.
Gulf States	57 .2	56 .8	0°.4 below.
Lower Lake region	36 .2	39 .3	3°.1 above.
Upper Lake region	32 .9	35 .2	2°.3 above.
Ohio valley and Tennessee	42 .3	44 .2	1°.9 above.
Upper Mississippi valley	35 .0	34 .9	Normal.
Lower Missouri valley	37 .6	33 .1	4°.5 below.
Minnesota	26 .3	23 .5	2°.8 below.
Pacific Coast	53 .4	54 .2	1°.1 above.

No. II.



TEMPERATURES OF WATER FOR NOVEMBER, 1876.

STATIONS.	Temperatures at bottom.		Average depth of water.
	Maximum.	Minimum.	Feet.
Alpena	44	33	14
Augusta	63	50	5
Baltimore	53	45	10
Buffalo	50	34	13
Burlington	51	43	17
Cairo	—	42	26
Charleston	68	55	40
Chicago	48	37	10
Cincinnati	57	40	18
Cleveland	53	34	14
Detroit	50	37	22
Duluth	43	36	14
Eastport	49	44	17
Escanaba	45	32	19
Grand Haven	49	35	19
Keokuk	50	33	5
Knoxville	50	42	13
La Crosse	48	29	3
Louisville	59	40	7
Memphis	61	49	20
Marquette	42	34	17
Milwaukee	37	34	20
Mobile	71	57	15
Montgomery	65	50	7
Nashville	63	43	12
New London	55	47	11
New York	50	39	16
Norfolk	61	47	24
Omaha	45	—	23
Pittsburgh	54	41	9
Portland, Maine	47	41	26
St. Marks	67	60	17
St. Louis	60	32	11
St. Paul	46	33	3
Savannah	—	52	8
Toledo	56	—	12
Wilmington	63	51	11
Woods's Holl	50	39	8
Yankton	48	32	4

Total snow-fall.—The total snow-fall during the month has, in the respective States, ranged as follows, being given in inches as it fell: Dakota, 2 inches; Minnesota, 10; Nebraska, 4 to 10; Kansas, 2 to 6; Arkansas, 1 to 3; Missouri, 3 to 11; Wisconsin, 2 to 6; Illinois, 3 to 8; Michigan, 6 to 9; Indiana, 1 to 12; Ohio, 2 to 9; Kentucky, 1 and 2; Tennessee, 8 to 10; North Carolina, 4; Virginia, 2 to 7; Maryland, 1 to 2; Delaware, 1; New Jersey, 1 to 7; Pennsylvania, 2 to 5; New York, 1 to 11; Connecticut, 2; Massachusetts, 1 to 5; Vermont, 4 to 5; New Hampshire, 3. A few stations report *snow lying on ground at end of month* as follows: Nebraska, 2 inches; Minnesota, 2; Wisconsin, 2 to 4; Missouri, 1 to 3; Arkansas, 1; Michigan, 1 to 2; Indiana, 2 to 5; Kentucky, 1; Ohio, 1 to 3; Pennsylvania, 1; New York, 7.

Rainy days.—The number of days on which a greater or less quantity of rain or snow fell during the month ranges from 9 to 16 at stations in New England; Middle Atlantic States, 8 to 17; South Atlantic States, 3 to 19; Gulf States, 6 to 13; Ohio Valley and Tennessee, 9 to 21; Lower Lake region, 18 to 25; Upper Lake region, 10 to 22; Northwest, 7 to 16; Rocky Mountain stations, 6 to 14; California, 2.

Cloudy days.—The number of days during the month on which the cloudiness has equaled eight on a scale of ten, as reported by voluntary observers, ranges as follows: New England, 7 to 20; Middle States, 6 to 24; South Atlantic States, 5 to 15; Gulf States, 6 to 16; Ohio Valley and Tennessee, 8 to 25; Upper Lake region, 10 to 24; Northwest, 5 to 21.

Droughts.—At the close of the month, at South Hartford, N. Y., wells and fountains low. At Woodstock, Vt., drought very severe. At West Charlotte, Vt., many wells and springs dry; water in Lake Champlain very low. At Westminster, Vt., continues very dry.

RELATIVE HUMIDITY.

The mean relative humidity for the month, as reported from the Signal-Service stations, ranges in New England from 72 to 79 per cent.; Middle Atlantic States, 68 to 82; South Atlantic States, 64 to 78; Gulf States, 64 to 76; Indian Territory, Arkansas, and Tennessee, 58 to 71; Lower Lake region, 73 to 79; Upper Lake region, 72 to 85; Ohio and Upper Mississippi Valleys, 65 to 76; Missouri Valley, 61 to 77; Minnesota, 72 to 82; Cheyenne, 49; Denver, 46; Santa Fé, 56; Salt Lake City, 54; Virginia City, 60; San Diego, 61; San Francisco, 69; Pike's Peak, 74; Mount Washington, 84.

WINDS.

The prevailing winds for the month are shown by the arrows on Chart No. II. They have very generally been from the northwest, except in Florida. The prevailing winds that were from exceptional directions were south at Chicago, Denver, Erie, Knoxville, La Crosse, and Saint Mark's; southeast at Grand Haven and Oswego; southwest at Toledo, Cleveland, Morgantown, and Jacksonville. The prevailing winds were northwest on Mount Washington and west on Pike's Peak.

Total movements of the air.—The following are the largest total movements of the air during the month, as recorded at the Signal-Service stations: Pike's Peak, 16,443; Sandy Hook, 12,242; Cape May, 11,887; Cape Lookout, 11,308; Kittyhawk, 11,183; Barnegat, 10,655; Thatcher's Island, 10,552; Indianola, 10,199. Smallest movements: Lynchburg, 2,069 miles; San Diego, 2,229; Augusta, 2,584; Salt Lake City, 2,887; Barnegat, 2,991.

Highest winds.—Among the highest wind-velocities reported from the Signal-Service stations during the month are the following: Mount Washington, 28th, NW., 108 miles per hour; Pike's Peak, 30th, 83; Sandy Hook and Barnegat, 20th, NE., 68; Kittyhawk, 4th, NE., 55; New York and Boston, 20th, NE., 50; Malone, 50.

VERIFICATIONS.

Probabilities.—The detailed comparison of the tri-daily weather probabilities, with the telegraphic reports for the succeeding 24 hours, shows a percentage of verifications of 83.9, and a percentage of omissions of 0.6. In detail, the verifications have been as follows: For weather, 88.4; wind, 85.7; temperature, 82.6; barometer, 78.9. The geographical distribution of the verifications has been: New England, 82.5; Middle States, 82.0; South Atlantic States, 83.7; East Gulf States, 82.2; West Gulf States, 83.4; Lower Lakes, 82.9; Upper Lakes, 86.6; Tennessee and Ohio Valley, 84.4; Upper Mississippi Valley, 86.7; Lower Missouri Valley, 84.3.

Cautionary signals.—There have been displayed 208 cautionary storm signals at United States stations. Of these, 102 were justified at the stations, and 49 others, or 73 per cent. in all, justified within 100 miles of the station; 51 were not justified, and 6 were displayed too late; 35 cases were reported in which signals were needed but not displayed, in 7 of which cases orders had been issued but failed to be received owing to derangement of telegraph-lines.

NAVIGATION.

The highest and lowest readings on the Signal-Service river-gauges are given in table on Chart No. III, from which it appears that the Missouri was highest during the first three days of the month and lowest during the last three. The Mississippi was generally lowest on the 1st and 30th, and highest from the 10th to 20th. The Ohio and tributaries were swelled for a short time by a flood, which reached its height between the 2d and 28th. At Shelburne, N. H., on the 1st, Androscoggin River was lower than ever before known. Wappinger's Falls, N. Y., during the first of month, water in lake so low that factories could not run.

Ice in rivers is reported as follows: On the 6th, at Breckenridge, Red River of the North full of floating ice and closed on the 7th; 30th, at Buffalo, ice 2 inches thick; 28th, 29th, and 30th, at Davenport and Keokuk, floating ice; at La Crosse, 24th to 29th, floating ice, when all boats were withdrawn; frozen over 30th; Omaha, 14th, floating ice; 18th, river gorged; 24th, river closed. Pembina, 9th, navigation closed on the Red River of the North; 14th, ice thick enough to sustain teams; Moorhead, Minn., Red River of the North crossed by teams, 4th; Saint Paul, 14th to 23d, floating ice; 19th, navigation closed; 30th, river frozen over; Yankton, 14th, river closed by ice; Fort Sully, 8th to 21st, floating ice; 22d, river closed; Firesteel, Dak., 13th, James River frozen; Hennepin, Ill., 28th, Illinois River closed; Rockford, Ill., 29th, Rock River closed; Muscatine, Iowa, 22d to 30th, floating ice; 30th, ferry-boat ceased running.

TEMPERATURE OF WATER.

The maximum and minimum temperatures at the bottom of the water are given in the table on Chart No. II. The highest maxima are: 71° at Mobile; 68° at Charleston; 67° at Saint Mark's; 65° at Montgomery; and 63° at Augusta, Nashville, and Wilmington. The lowest minima are: 29° at La Crosse; 32° at Escanaba, Saint Louis, and Yankton; and 33° at Alpena, Keokuk, and Saint Paul.

Ranges of water temperatures.—The largest ranges: Saint Louis, 28°; Memphis, 21°; Nashville, 20°; La Crosse and Louisville, 19°; Cincinnati and Keokuk, 17°. The smallest ranges: Eastport, 5°; Portland, Me., 6°; Duluth and Saint Mark's, 7°; Baltimore, Burlington, Knoxville, Marquette, and New London, 8°.

ATMOSPHERIC ELECTRICITY.

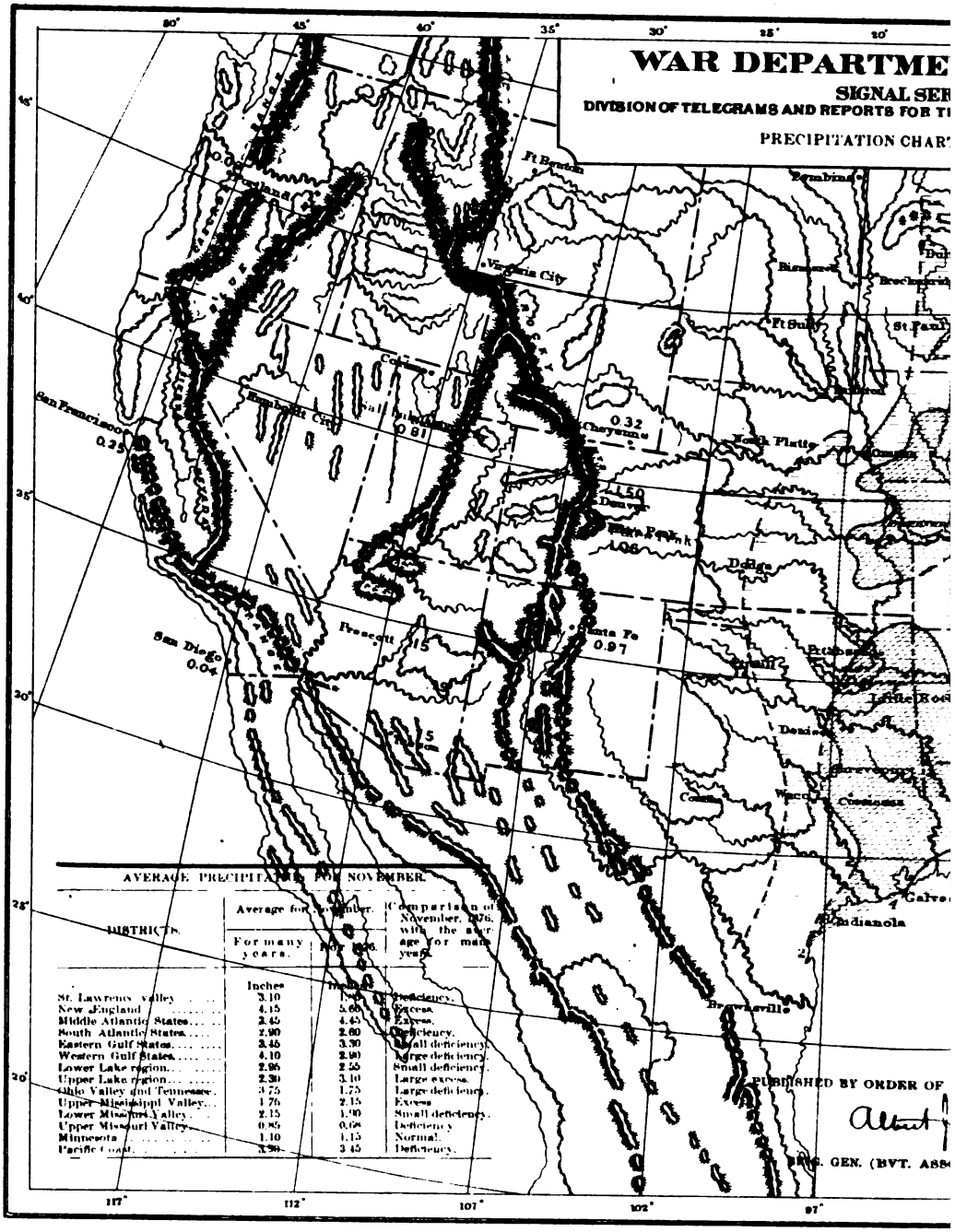
Thunder-storms have occurred as follows: On the 1st, in New York, Texas, Kansas, Massachusetts, Missouri; 2d, New York, South Carolina, Tennessee; 3d, North Carolina; 5th, Indian Territory, Missouri; 6th, Georgia, Illinois, New York, North Carolina, Tennessee; 7th, New Jersey, New York; 14th, Kansas; 18th, Pennsylvania; 19th, North Carolina; 20th, Delaware, Virginia.

Auroras were observed on the 9th at Alpena and Escanaba, Mich.; 10th, Pembina, Dak., Grand Rapids, Northport, and Alpena, Mich., Duluth, Minn., Embarrass, Rocky Run, and Leroy, Wis.; 12th, Fort Sully, Dak., Cornish and Standish, Me., Boston, Mass., North Argyle, N. Y.; 13th, Waltham, Mass., Auburn, N. H.; 17th, Brookhaven, N. Y. The aurora of the 12th was also observed from the schooner Addie Fuller in 41° 14′ N., 71° 10′ W., or near Cape Cod.

OPTICAL PHENOMENA.

Solar halos are noted as follows: 1st, in Illinois, Florida, Maine, New York, Ohio, Tennessee; 2d, New York, New Hampshire, North Carolina; 4th, Ohio; 5th, South Carolina, Michigan, Pennsylvania, Ohio, Tennessee; 6th, Illinois, Maine, Massachusetts, New Hampshire, Tennessee, Vermont; 7th, South Carolina, Iowa, Nebraska; 8th, Texas; 9th, Michigan, Tennessee; 10th, Tennessee; 11th, Texas, North Carolina, Tennessee; 12th, Iowa, Indian Territory, Illinois, Michigan, Wisconsin; 13th, South Carolina, Dakota, Georgia; 14th, South Carolina, North Carolina, Wisconsin; 17th, New York, Maine, New Hampshire; 18th, Maine, New Hampshire; 21st, Wyoming, Kentucky; 22d, Illinois, Iowa, Kansas, Nebraska; 23d, Georgia, North Carolina, Tennessee; 24th, South Carolina, North Carolina, Georgia; 26th, Maine, New Hampshire, Tennessee, Vermont; 27th, Minnesota, New York, Dakota, Nebraska, New Hampshire, Ohio; 28th, Missouri, New Hampshire, Ohio; 29th, Indiana, Nebraska, Ohio; 30th, Dakota, New York, Illinois, Indiana, Iowa, Nebraska, New Hampshire, Pennsylvania.

Lunar halos were observed on the 1st in Georgia, Ohio, Illinois, Minnesota, Pennsylvania, Indiana, Tennessee, Kentucky, Alabama, Florida, Utah, Dakota, New Jersey, Virginia; 2d, New Jersey, Michigan, Tennessee, Connecticut, Rhode Island, Virginia, North Carolina, West Virginia, Delaware, Georgia, New York, Ohio, Pennsylvania; 3d, North Carolina, Missouri, Georgia, Tennessee; 4th, New Jersey, South Carolina, Alabama, North Carolina, Colorado, Georgia, Ohio; 5th, Michigan, Maryland, New York, Pennsylvania, Rhode Island, North Carolina, New Jersey, Missouri, Ohio, Tennessee; 6th, Florida, New York; 7th, Tennessee; 8th, Missouri; 10th, Vermont; 19th,



AVERAGE PRECIPITATION FOR NOVEMBER.

DISTRICTS.	Average for November. For many years.	Nov. 1876.	Comparison of November, 1876, with the average for many years.
	Inches	Inches	
St. Lawrence valley	3.10	1.80	Deficiency.
New England	4.15	5.60	Excess.
Middle Atlantic States	3.45	4.45	Excess.
South Atlantic States	2.90	2.60	Deficiency.
Eastern Gulf States	3.45	3.30	Small deficiency.
Western Gulf States	4.10	2.90	Large deficiency.
Lower Lake region	2.95	2.55	Small deficiency.
Upper Lake region	2.30	3.10	Large excess.
Ohio Valley and Tennessee	3.75	1.75	Large deficiency.
Upper Mississippi Valley	1.75	2.15	Excess.
Lower Missouri Valley	2.15	1.90	Small deficiency.
Upper Missouri Valley	0.85	0.68	Deficiency.
Minnesota	1.10	1.15	Normal.
Pacific Coast	3.90	3.45	Deficiency.

No. III.



HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, NOV., 1876.

STATIONS.	Danger point on gauge.		Highest Water. Date.	Highest Water. Height.		Lowest Water. Date.	Lowest Water. Height.	
	ft.	in.	Nov.	ft.	in.	Nov.	ft.	in.
RED RIVER.								
Shreveport	29	9	30	6	6	13	2	8
MISSOURI.								
Fort Sully	—		—	—	—	—	—	—
Yankton	20		1	4	3	11	3	9
Omaha	16		1,2	3	0	20	1	8
Leavenworth	21		3	7	8	27to29	4	9
MISSISSIPPI.								
St. Paul	14	6	9to11	3	2	26	1	11
La Crosse	18		15, 16	[illegible]	9	1,29	0	8
Dubuque	21	10	18,19,21	5	2	30	3	8
Davenport	15		12,13,23,24	3	7	2	2	9
Keokuk	14	6	11	5	8	1	[illegible]	1
St. Louis	30		19	13	3	1, 30	[illegible]	9
Cairo	40		6	13	4	1	[illegible]	0
Memphis	34		9	10	10	3	7	9
Vicksburg	41		[illegible]	14	5	1, 2	11	5
New Orleans *	2	6	—	—	—	30	14	4
CUMBERLAND.								
Nashville	[illegible]		27,28	5	2	16to19	1	2
OHIO.								
Pittsburgh	20		22	8	9	5	[illegible]	[illegible]
Cincinnati	30		27	17	2	4,5	8	[illegible]
Louisville	24		28	8	2	6	5	3
SAVANNAH.								
Augusta			21,30	6	5	14	4	8

* Below high water mark

Louisiana; 20th, Missouri; 21st, Nebraska, Iowa, West Virginia; 22d, Indiana, Wisconsin, Missouri, Florida, Illinois; 23d, Iowa, Missouri, Mississippi, Nebraska, New Jersey, Tennessee; 24th, South Carolina, Iowa, Tennessee, Virginia, North Carolina, Missouri, New Jersey; 25th, Indian Territory, Rhode Island, Nebraska, North Carolina, Minnesota, Iowa, Massachusetts, Missouri; 26th, Georgia, Illinois, Virginia, New York, Alabama, Tennessee, Pennsylvania, North Carolina, Minnesota, Massachusetts, Ohio, Maine, Michigan, Nebraska, New Hampshire; 27th, Maine, New York, New Jersey, Virginia, Kentucky, Alabama, Missouri, Indiana, Iowa, Nebraska, New Hampshire; 28th, New Jersey, Ohio, Iowa, Indiana, Wisconsin, West Virginia, New York, Georgia, Minnesota, Maryland, Pennsylvania; 29th, Iowa, Maryland, New York, Ohio, Michigan, Maine, West Virginia, Alabama, Pennsylvania, New Jersey, District of Columbia, Florida, Indiana, Wisconsin; 30th, New Jersey, Maryland, Ohio, Michigan, Texas, Wisconsin, Alabama, Connecticut, Rhode Island, New York, Pennsylvania, Florida, North Carolina, Massachusetts, District of Columbia, Delaware, Illinois, Indiana, Iowa, Minnesota, Nebraska.

Mirage was observed on the 7th at Sedgwick, Kans.; 16th and 28th, Breckinridge, Minn.

MISCELLANEOUS PHENOMENA

Zoological.—Wild geese were seen at West Point, N. Y., flying south, 16th; Saint Meinrad, Ind., southwest, 16th; Leesburgh, Ind., east, 8th; Fort Madison, Iowa, north 14th and 20th, south 6th, east 30th; Owing's Mills, Md., north, 25th; Fall River, Mass., southwest, 17th; Waltham, Mass., southwest, 15th; Clear Creek, Nebr., were plenty 7th; nearly all had left by 16th; Carson City, Nev., south, 3d; Vineland, N. J., south, 8th; Ardenia, N. Y., south, 18th to 25th; Kensico, N. Y., southwest, 12th; Hector, N. Y., south, 15th and 16th; Flushing, N. Y., south, 15th; Carthagena, Ohio, north, 15th; Euphrata, Pa., south, 29th; Melissa, Tex., were flying around 28th; Strafford, Vt., south, 15th; Embarrass, Wis., south, 1st; Atlantic City, N. J., south, 16th and 21st; Cincinnati, Ohio, south, 22d; Cairo, Ill., south, 27th; Davenport, Iowa, south, 4th and 5th; Keokuk, Iowa, south, 26th; Malone, N. Y., south, 21st; Pittsburgh, Pa., southwest, 9th; Springfield, Mass., south, 14th and 18th; Washington, D. C., south, 7th. *Wild ducks* were seen at Davenport, Iowa, flying south, 3d, 4th, 5th, 25th, 26th, 27th, and 28th; Clear Creek, Neb., south, 5th; Wappinger's Falls, N. Y., east 15th, and south 28th; Ephrata, Pa., west, 14th; Corning, Mo., were flying about daily. *Sand-hill cranes* were seen at Fort Madison, Iowa, 7th. *Blackbirds* were seen at Jacksonborough, Ohio, flying south, 24th. *Robins* last seen at Webster City, Iowa, 1st. *Phœbebird* last seen at Waltham, Mass., 16th. *Ground-sparrows* last heard at Contoocookville, N. H., 3d. *Yellow-bird* last heard at Contoocookville, N. H., 23d. *Grasshoppers:* In Texas a dense cloud of grasshoppers appeared during the last 10 days of November; at Vevay, Ind., a remarkable shower of grasshoppers on the 13th; at Baxter Springs, Kans., grasshoppers were killed on the 14th by the snow-fall; at Cincinnati, Ohio, large grasshoppers alighting on the 14th.

Polar bands were reported as having been seen on the 1st at Carthagena, Ohio; 3d, Boonsborough, Iowa; 5th, Wytheville, W. Va.; 6th, Danville, Ky.; 7th, Iowa City, Iowa; 8th, Boonsborough, Iowa; 11th, Danville, Ky., Carthagena, Ohio, and Iowa City, Iowa; 12th, Carthagena, Ohio; 14th, Freehold, N. J.; 22d, Iowa City, Iowa; 24th, Bennettsville, Ky., and Wytheville, W. Va.: 27th, Danville, Ky.; 28th, Freehold, N. J.; 29th, Carthagena, Ohio.

Zodiacal light.—16th, Nashville, Tenn.; 24th, Atco, N. J.

Meteors have been observed as follows: 1st, in New York; 3d, Massachusetts, New York; 4th, New Hampshire; 5th, Colorado, Mississippi, North Carolina, Ohio, Pennsylvania, West Virginia, Wyoming; 6th, Indiana, Massachusetts; 7th, Florida; 8th, North Carolina; 9th, Illinois, Iowa, Missouri, New Jersey, Pennsylvania; 10th, Illinois, Iowa, Maryland, Missouri, Ohio; 11th, Indiana, Iowa, Maryland, New Jersey, North Carolina, Ohio, Pennsylvania; 12th, Florida, Indiana, Massachusetts, New York, Ohio, Pennsylvania; 13th, North Carolina, Pennsylvania; 14th, District of Columbia, Minnesota; 15th, Florida, Iowa; 16th, New Jersey, New York; 19th, Nebraska; 20th, North Carolina; 21st, New York; 22d, Florida, New Jersey; 27th, Maryland, Wisconsin; 28th, Ohio; 29th, Maryland, Pennsylvania; 30th, Massachusetts, New Jersey.

Forest and prairie fires.—Breckenridge, 2d and 10th; Pembina, 10th; Bennettsville, Ky., 11th.

Earthquakes.—An earthquake shock was felt at Eastport, Me., at 1 p. m. of the 20th.

Published by order of the Secretary of War.

ALBERT J. MYER,
Brig. Gen. (Brevet Assigned), Chief Signal-Officer, U. S. A.

PAPER 31.

MONTHLY WEATHER REVIEW, DECEMBER, 1876.

INTRODUCTION.

In compiling the present review use has been made of all meteorological data received up to January 15th from the Voluntary Observers, Army Post and Signal-Service Stations. The most prominent features in the meteorology of the month have been: 1st. The large number and very rapid movement of the areas of low pressure. 2d. The low temperature, which has averaged from 2° to 8° below the average for many years throughout the country east of the 100th meridian, as was anticipated in the review for September. On the Pacific slope the month has been warmer than usual. 3d. The absence of any area of very high pressure west of the Mississippi. 4th. The remarkable meteor of the 21st. 5th. The interesting solar halo of December 23d. 6th The absence of rain on the Pacific coast.

BAROMETRIC PRESSURE.

In general.—The distribution of average pressures for the month is shown by the isobars on Map No. II. The highest average is there located in the Lower Mississippi Valley, with a nearly equal pressure in Eastern Dakota. The lowest pressure is, as usual, over the Gulf of Saint Lawrence. The isobar of 30.00 passes from Lake Superior southeastward to New Jersey. The average pressures at stations received since the map was printed are Virginia City, 29.75; Fort Sully, 30.17; Pembina, 30.16; Bismarck, 30.06.

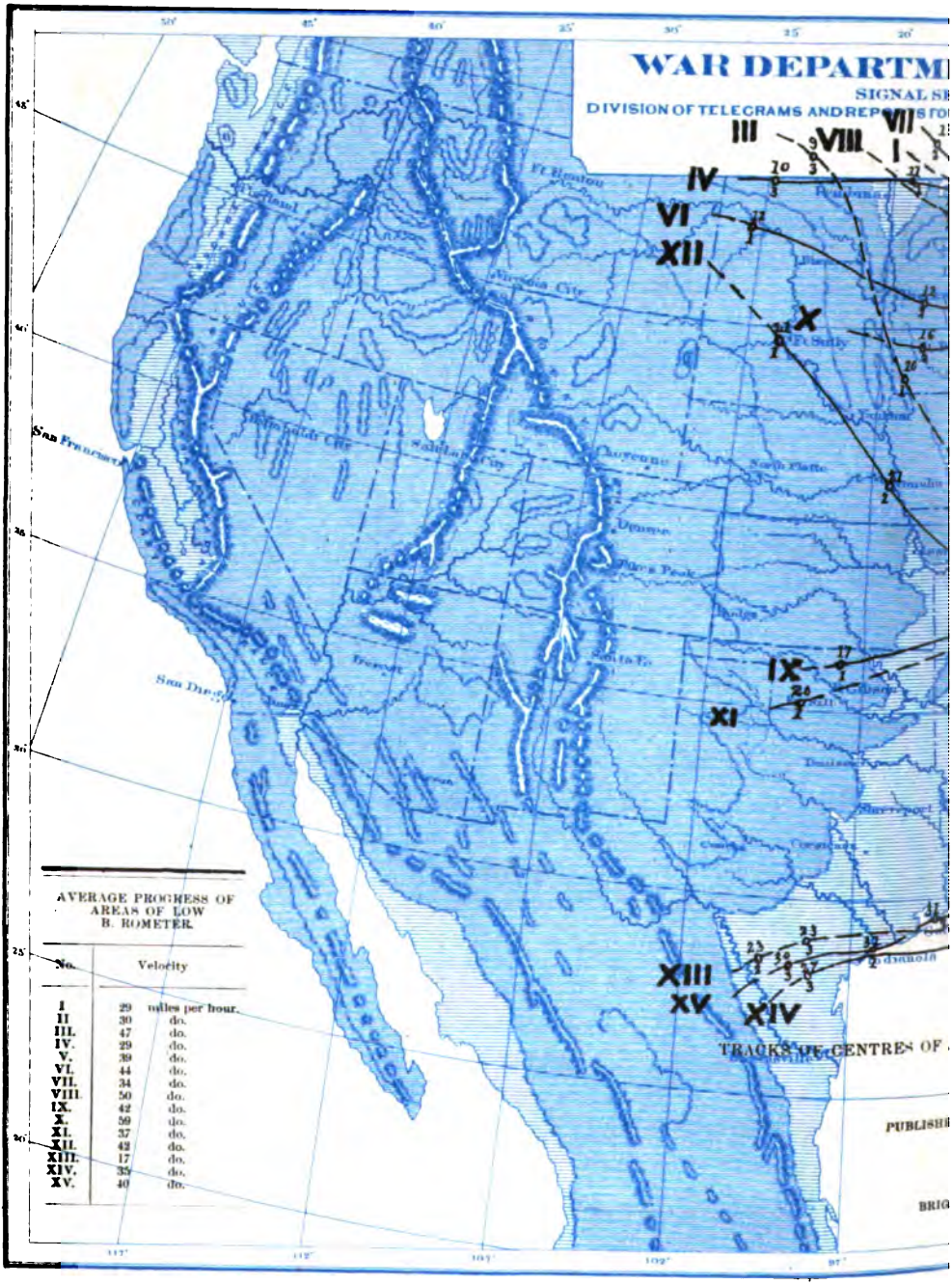
Areas of high barometer.—No. I. On the morning of the 1st of December the pressure was 30.85 in Dakota, diminishing thence eastward to the Atlantic. On the morning of the 2d the pressure had very generally diminished west of the Mississippi, but increased to the eastward. The area of highest barometer extended from Minnesota southeastward to Louisiana, with temperatures of —5° and +25° in these two States respectively. On the morning of the 3d the highest pressure continued to extend from Manitoba to the Gulf States, but gradients had generally diminished. On the morning of the 4th the pressure was highest in the Lower Missouri Valley, and on the morning of the 5th in Louisiana and Mississippi, while low barometer No. I was central over Manitoba. The area of highest pressure now moved eastward and was, on the morning of the 6th, central in Alabama, and on the morning of the 7th in Georgia and Florida.

No. II. This area appears on the morning of the 8th central in Texas, where it had apparently been formed by the flow of air from the northwestern portion of the State, in connection with the low barometer No. II that was then developing in the Lake region, and the falling pressure in the South Atlantic States. During the rest of December 8th the very general flow of cold air from the Northwest caused an extension of the area of high pressure over the whole country west of the Mississippi. The very severe storms known in local parlance as "blizzards" were reported on the 8th as prevailing in Iowa and Wisconsin, where temperatures of —15° and —20° prevailed, with violent northwest winds and much drifting snow. On the morning of December 9th the highest pressure was central over Missouri, Illinois, and Tennessee, whence it moved rapidly to the southeastward, being central over North Carolina on the morning of the 10th.

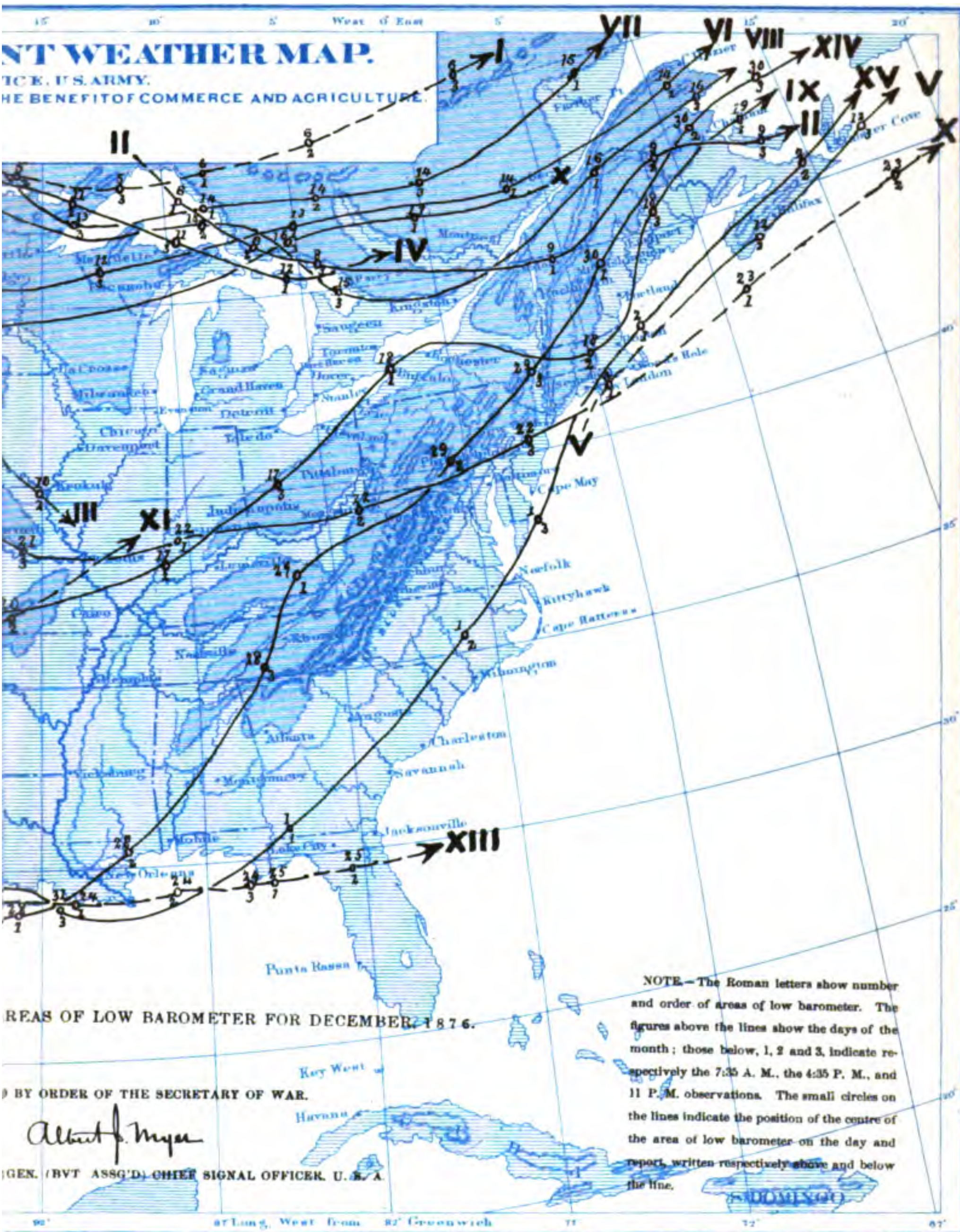
No. III. The low pressure that prevailed on the 11th over the Lake region was, as usual, attended by rising barometer, extending from the Gulf northward over the Gulf States, where it was quite well marked on the morning of the 12th. The central highest pressure was, however, by the morning of the 13th, transferred eastward to the South Atlantic coast.

No. IV. The low pressure No. VII over Lake Superior on the morning of the 14th, had, during its southeastward progress through British America, been followed by rising barometer on the Pacific coast. During the 13th and on the morning of the 14th the pressure was highest in Dakota, with very steep gradients eastward over Minnesota and Lake Superior. This formed a small but well-defined area of high pressure, which moved rapidly southeastward, being on the morning of the 15th central in Arkansas, and at midnight of the 15th central in Louisiana.

No. V. The rapidly rising barometer and very cold, high northerly winds in the rear of low barometer No. VIII, extended rapidly southward over the Northwest, where pressure was highest on the morning of the 16th, whence it extended eastward with unusual rapidity, and was on the morning of the 17th central in New York. This area of high pressure seems then to have taken a somewhat unusual course towards the northeast, being central over the Gulf of Saint Lawrence on the morning of the 18th.


WAR DEPARTM
SIGNAL SE
DIVISION OF TELEGRAMS AND REPORTS FO
III
VIII
VII
I
IV
VI
XII
X
IX
XI
XIII
XV
XIV
San Francisco
San Diego
Ft Benton
Virginia City
Salt Lake City
Cheyenne
North Platte
Denver
Pikes Peak
Santa Fe
Omaha
Cincinnati
Louisville
Nashville
Memphis
Vicksburg
Shreveport
Galveston
Indianola
Brownsville
AVERAGE PROGRESS OF AREAS OF LOW BAROMETER.
No. | Velocity
I 29 miles per hour.
II 30 do.
III. 47 do.
IV. 29 do.
V. 39 do.
VI. 44 do.
VII. 34 do.
VIII. 50 do.
IX. 42 do.
X. 59 do.
XI. 37 do.
XII. 42 do.
XIII. 17 do.
XIV. 33 do.
XV. 40 do.
TRACKS OF CENTRES OF
PUBLISHE
BRIG

No. I.


NT WEATHER MAP.
ICE, U.S. ARMY.
HE BENEFIT OF COMMERCE AND AGRICULTURE.
REAS OF LOW BAROMETER FOR DECEMBER, 1876.
BY ORDER OF THE SECRETARY OF WAR.
Albert J. Myer
GEN. (BVT ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.
NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:35 A. M., the 4:35 P. M., and 11 P. M. observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.
I
II
III
IV
V
VI
VII
VIII
IX
X
XI
XII
XIII
XIV
XV
Kingston
Rochester
Buffalo
Toronto
Saugeen
Chicago
Milwaukee
Grand Haven
Detroit
Toledo
Keokuk
Indianapolis
Pittsburg
Cairo
Nashville
Memphis
Atlanta
Vicksburg
Montgomery
Mobile
New Orleans
Charleston
Savannah
Jacksonville
Punta Rassa
Key West
Havana
Norfolk
Kittyhawk
Cape Hatteras
Wilmington
Cape May
New London
Portland
Halifax
Montreal
Marquette
Escanaba
La Crosse
Davenport
Evanston
S. DOMINGO

No. VI. The low barometer No. IX was, during the 17th, followed by high pressure No. VI, which moved directly southward, and was central on the morning of the 18th in Kansas, and on the morning of the 19th extended from Texas to Georgia, whence it spread over the Southern States, and was merged into the succeeding area.

No VII. Was central on the morning of the 19th in Manitoba, whence it moved eastward, and was on the 20th, 7.35 a. m., central in Canada, and on the 21st, 7.35 a. m., central in Maine, after which it disappears.

No. VIII. The slight depression No. XII, which was, on the morning of the 22d, central in the Ohio Valley, was followed by an extended southward flow of cold air over the western plains, and the highest pressure was, at 7.35 a. m., of the 23d, central in Dakota, whence it moved eastward over the Lakes, while low barometer No. XIII, developed in Texas and moved eastward along the Gulf coast. The highest pressure was, on the morning of the 25th, central in Upper Canada, and on the 26th, 7.35 a. m., central in Maine.

No. IX. The pressure remained pretty uniform on the 26th and 27th, but was, on the morning of the 28th, highest over the Upper Mississippi Valley, Lake region, and Middle States, while the severe storm center, No. XIV, was on the Louisiana coast. This storm was followed by an extensive area of high barometer, central in the Southwest, on the 29th and 30th, whence it moved northeastward, and was central in Tennessee on the morning of the 31st, while storm No. XV was advancing eastward over the Texas coast.

Areas of low barometer.—The areas of low barometer have been numerous, and have moved with unusual rapidity. The highest rate of progress has been that of No. X, being 59 miles hourly; the lowest, No. XIII, being 17 miles hourly. The average of all was 38 miles per hour. Of the fifteen tracks given on Chart No. I, seven belong to the Lake region, four passed through Missouri or Illinois, three came from Texas and one belonged to the Atlantic Ocean. In general this month has been considered very stormy and unpleasant, both on sea and land.

No. I. This depression was in Manitoba on the morning of the 5th, having evidently moved southeastward along the slope of the Rocky Mountains, while the barometer had been rising at Portland, Oreg. On the afternoon of December 6th, 4.35 p. m., the depression was very extensive and central north of Lake Huron. December 7th, 4.35 p. m., the depression was apparently central in New Brunswick, and followed by light snow over the Lower Lakes and New England.

No. II. This depression first appears December 8th, 7.35 a. m., over Lake Superior, whither it had moved from the north or northwest. The barometer fell rapidly during the day over the eastern portion of the Lakes, but was rising rapidly over the western portion, with very low temperatures and northwest gales. By 7.35 a. m. of the 9th the area of lowest pressure, 29.10, extended as an elongated oval from Montreal to Boston, with very cold westerly gales over the Middle States and Lakes. Among the highest winds reported were: Cape May, southwest, 72 miles; Grand Haven, west, 49; Erie, west, 48; Port Huron, west, 35; New York, west, 60; Sandy Hook, west, 84; New Haven, west, 40; Newport, southwest, 60; Wood's Holl, northwest, 50; Wilmington, northwest, 29; Rochester, southwest. 36; Oswego, northwest, 36; Portland, Me., east, 38; Philadelphia, northwest, 42; Marquette, northwest, 54; Eastport, east, 43; Grand Haven, west, 49; Cape Lookout, west, 50; Barnegat, west, 45; Boston, west, 50. The depression continued moving eastward, and was, December 9th, 11 p. m., central over the Bay of Fundy, with the lowest pressure, 28.80.

No. III. While No. II was moving over New England, depression No. III was moving southeastward over Dakota, having evidently originated on the eastern slope of the Rocky Mountains, since the pressure at Portland, Oreg., had remained nearly stationary for several days. December 10th, 7.35 a. m., it was central in the Northwest, whence it moved southeast and eastward, and disappeared over Ohio during the day, being merged into the more extensive depression that followed.

No. IV. This depression seems also, like No. III, to have rapidly advanced from the Northwest into Manitoba, where it rapidly developed on December 10th, between 4 p. m. and 11 p. m., and on the morning of the 11th was central north of Minnesota; during the rest of that day it extended southward over the Lake region and Canada, where it was central on the morning of the 12th. During the rest of the day No. IV slowly disappeared during the advance of No. VI.

No. V. This depression seems to have originated near Cape Hatteras during the 11th between the areas of northeast winds that prevailed to the northward, and of southwest winds that prevailed to the southward of this region. It was on the morning of the 12th apparently but a slight depression, but a severer storm may have prevailed to the eastward, whose nucleus was central near Halifax at 4.35 p. m., and near Cape Breton at 11 p. m., at which place the pressure had fallen to 29.02, showing that a severe storm was then under way.

No. VI. This depression first appears in Montana and Western Dakota on the morning of the 12th, whence it moved due eastward over the Upper Lakes into Canada, and

thence northeast down the Saint Lawrence Valley, but is not traceable on the weather-maps after 4.35 p. m. of the 13th.

No. VII. This depression very closely followed No. VI, and may possibly be considered as its western portion. It was, 4.35 p. m. December 13, central north of Minnesota, whence it moved southeastward to Lake Superior, followed by a very steep gradient. On the 14th it moved eastward along the northern limit of Canada, while brisk northwest winds, cloud and snow, prevailed over the Lakes; it was, on the morning of the 15th, central at the mouth of the Saint Lawrence.

No. VIII. Like four of the preceding areas, No. VIII descended from Manitoba southeastward to Lake Superior, where it was central on the morning of the 15th. It continued during the day moving southeastward to Lake Ontario, but at midnight turned northeastward, and at 7.35 a. m. of the 16th was central in Northern Maine. Gales and high winds from southwest to northwest prevailed over the Lakes, Saint Lawrence Valley, Middle and Eastern States on the 15th and 16th, while the central depression seems to have spread over the entire Gulf of Saint Lawrence, where the storm was quite severe.

No. IX. This depression originated in Kansas and Northern Texas, over which region, warm southerly winds prevailed on the 16th. These winds, at 11 p. m. of the 16th, extended continuously northward to Montana and Manitoba, and were evidently due to the low barometer that prevailed at the Rocky Mountain and Pacific coast stations. Toward the same region of low barometer there also set in after 11 p. m. of the 16th, strong north and east winds, which, on the morning of the 17th, prevailed from Kansas and Missouri northward, and were possibly, in part, a consequence of the precipitation, in the form of light cloud and light rain or snow, which had taken place before 7.35 a. m. December 17, over the entire country west of the Mississippi. The depression moved rapidly eastward over the Ohio Valley, and thence northeast along the western slope of the Alleghanies to New York, where it was central December 18, 7.35 a. m., and whence it turned during the day abruptly eastward to Cape Cod. It was, at 11 p. m., central near Eastport, Me., the lowest barometer being 29.25, and with severe easterly gales at Halifax and Eastport. Its last location was in the morning, December 19, near Prince Edward's Island, Gulf of Saint Lawrence, with a central pressure of 29.00 or less, and severe storm throughout the neighboring region.

No. X. This depression seems to have originated on the 18th between 7.35 a. m. and 4.35 p. m. The area of high barometer No. VI, which was then central in Kansas and Arkansas, appears to have supplied an abundant flow of air northward toward Nebraska, Iowa, and Central Minnesota. The temperatures in these States rose with unusual rapidity between the morning and afternoon observations, some of the changes in the nine hours being as follows: Cheyenne, 27°; Denver, 25°; North Platte, 45°; Fort Sully, 39°; Omaha, 33°; Leavenworth, 23°; Keokuk, 23°; La Crosse, 18°; Saint Paul, 22°; Duluth, 18°. Equally decided was the southward flow of cold air from British America toward the same region, on the north side of which temperatures fell or remained stationary. It was in the region between these opposing winds and strongly contrasted temperatures that cloud and haze formed during the day, and that the area of lowest pressure was rapidly developed as a trough stretching from Southern Minnesota northeastward into British America. On the morning of the 19th this area was central in Canada, with branches extending far to the southeast and southwest, but its farther progress cannot be traced, as it seems to have become merged into No. IX, and the general depression then existing to the eastward.

No. XI. On the 20th, 7.35 a. m., the low barometer that had apparently been developing in New Mexico during the previous night was central in Indian Territory, whence it moved northeastward, with light rains, in the Gulf States, and was dissipated during the day over the Ohio Valley, without having been accompanied by high winds at any of our stations.

No. XII. This depression appears first in Western Dakota, at 11 p. m. of the 20th, while the temperatures had greatly fallen in Manitoba, with light northerly winds and clear weather. The central depression moved quite rapidly southeastward to Missouri, where it was central 11 p. m. 21st, preceded by extensive rains over the Southern States; thence its course was eastward to the New Jersey coast, which it reached on the 22d, 11 p. m., accompanied by snow over the Lower Lakes, Middle and Eastern States, and by high northeast to northwest winds on the Atlantic coast. It was last seen at 4.35 p. m. of the 23d, east of Cape Breton, moving rapidly northeast.

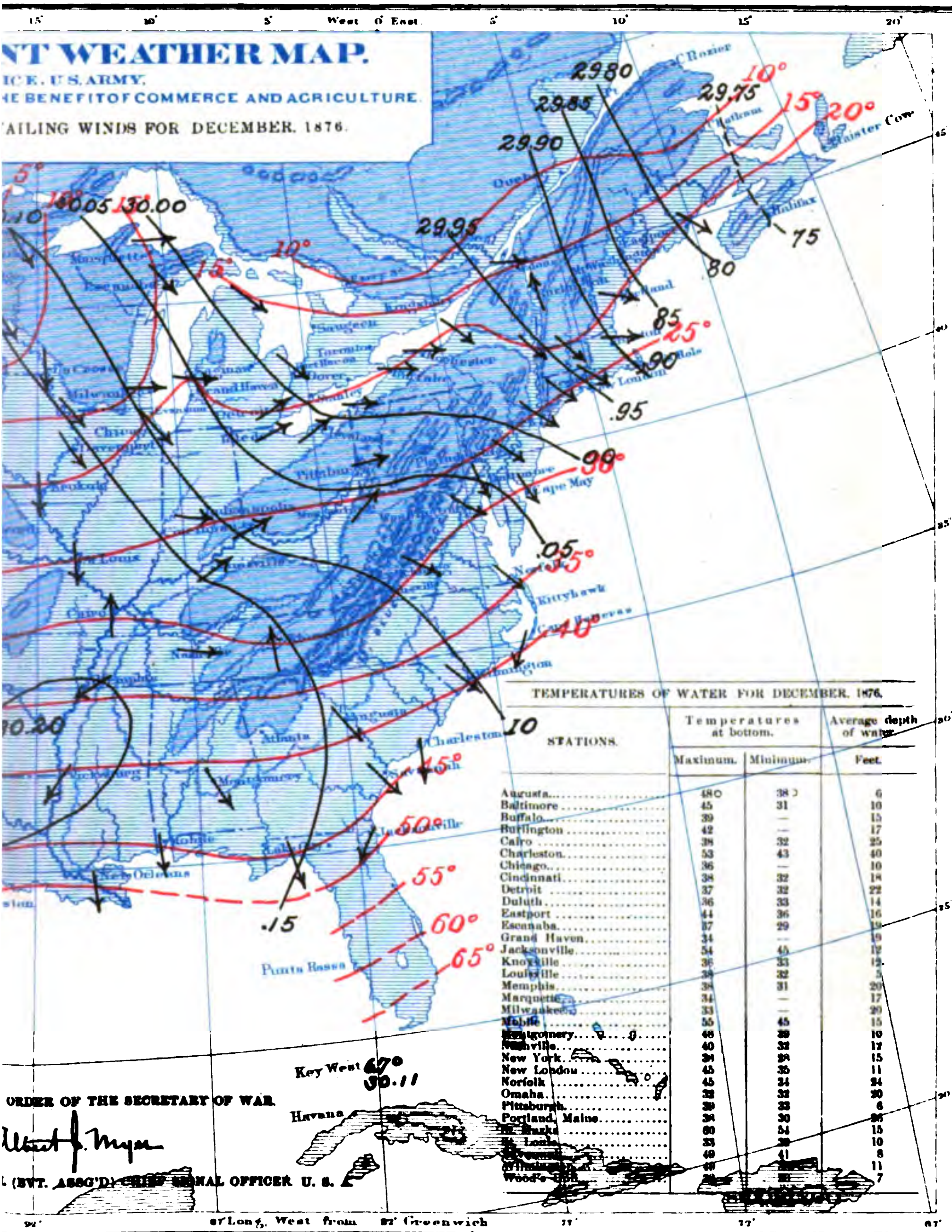
No. XIII. The moderate norther that followed low barometer No. XII seems to have been in great part induced by the low pressure prevailing from Texas to California on the 22d, and to have given rise to the area of rain and subsequent low pressure, No. XIII, which was central on the western border of Texas at 4.35 p. m. of the 23d. The barometric depression of the 22d was evidently one of many similar cases in which an area of low barometer, existing upon the Pacific coast of Mexico, is transferred to the eastern slope of the Cordilleras, precisely as occurs frequently along the coast from Alaska to Oregon. In both regions the consequences are similar, namely, a strong flow of air westward, up the slope of the Rocky Mountains, and the formation of areas of



AVERAGE TEMPERATURES FOR DECEMBER.

DISTRICTS.	Average for December.		Comparison of December, 1876, with the average for many years.
	For many years.	For 1876.	
St. Lawrence valley	17°.9	11°.0	6°.9 below.
New England	28 .4	22 .9	5°.6 below.
Middle Atlantic States	35 .7	29 .2	6°.5 below.
South Atlantic States	49 .3	41 .4	7°.9 below.
Gulf States	52 .4	46 .3	6°.1 below.
Lower Lake region	28 .0	19 .3	8°.7 below.
Upper Lake region	21 .8	16 .1	5°.7 below.
Ohio valley and Tennessee	35 .6	27 .6	8°.0 below.
Upper Mississippi valley	24 .2	15 .5	8°.7 below.
Lower Missouri valley	25 .2	20 .0	5°.2 below.
Minnesota	11 .0	4 .0	7°.0 below.
Pacific Coast	46 .5	49 .0	2°.5 above.

No. II.



TEMPERATURES OF WATER FOR DECEMBER, 1876.

STATIONS.	Temperatures at bottom.		Average depth of water.
	Maximum.	Minimum.	Feet.
Augusta	48°	38°	6
Baltimore	45	31	10
Buffalo	39	—	15
Burlington	42	—	17
Cairo	38	32	25
Charleston	53	43	40
Chicago	36	—	10
Cincinnati	38	32	18
Detroit	37	32	22
Duluth	36	33	14
Eastport	44	36	16
Escanaba	37	29	19
Grand Haven	34	—	19
Jacksonville	54	45	12
Knoxville	36	33	12
Louisville	38	32	5
Memphis	38	31	20
Marquette	34	—	17
Milwaukee	33	—	20
Mobile	55	45	15
Montgomery	48	39	10
Nashville	40	32	17
New York	34	29	15
New London	45	35	11
Norfolk	45	34	24
Omaha	32	32	30
Pittsburgh	39	33	6
Portland, Maine	34	30	26
St. Marks	60	54	15
St. Louis	35	38	10
[illegible]	49	41	8
Wilmington	49	[illegible]	11
Wood's Hole	[illegible]	[illegible]	7

cloud, rain, and snow, with new centers of low pressure. The course pursued by No. XIII was slowly eastward along the Gulf coast to Northern Florida, over which it disappeared 4.35 p. m. of the 25th, having been accompanied by heavy rains throughout the Gulf and South Atlantic States, and followed by a severe norther over the Western Gulf coast.

No. XIV. This area seems to have originated in Western Texas under conditions very similar to those attending the formation of No. XIII. It was central near the Texas coast at 11 p. m. of the 22d, whence it moved slowly eastward to the mouth of the Mississippi, and then turned to the northeastward through Alabama and West Virginia into Eastern New York, where it was central at 11 p. m. of the 29th. The central low barometer had steadily and rapidly fallen from 29.80, at 11 p. m. of the 27th, and 29.65, at 11 p. m. of the 28th, to 28.85 at 11 p. m. of the 29th. At which time also the area of snow and rain, with high winds or gales, covered the Lower Lakes, Middle and Eastern States, making this one of the severe storms of a very stormy month. The depression continued its course northeastward on the 30th, and was at midnight central over the Gulf of Saint Lawrence.

No. XV.—While No. XIV was, during the evening of December 30, passing over New Brunswick, and the highest pressure was central in the eastern Gulf States, a third depression, No. XV, was developing in Western Texas or Northern Mexico, in consequence of the precipitation of moisture that had been carried by easterly winds up the slope of the Rocky Mountains. This depression was central at midnight of the 30th west of Indianola, but at 7.35 a. m. of the 31st was, as a violent storm, central between Indianola and Galveston. It moved eastward during the rest of the 31st, with increasing severity, and was, on the morning of January 1, 1877, central in Georgia, while northerly gales prevailed in the Western Gulf. The track of this memorable storm, during the 1st and 2d of January, is shown on Chart No. I, but its further history belongs to the Review for that month.

Storms at sea have been reported by numerous vessels, among them as follows: On the 1st, heavy northwest gales off Cape Horn; also in latitude 44° north, longitude 40° west; hurricane in 37° north, 16° west. On the 1st and 2d, northwest gale off Cape Hatteras. On the 4th, heavy northwest gale 30° north, 70° west; hurricane near the Orkney Islands. On the 7th, storm near Cape May; on the 8th, heavy west gale off Cape Hatteras; on the 9th, furious northwest gale prevailed along the Middle and East Atlantic coast, increasing to a hurricane force in some localities. This gale was felt at sea as follows: On the Western Bank; also at 40° 15′ north, 67° west; at 43° north, 64° west (a hurricane, bar. 28.80); at 42° north, 61° west; at 40° north, 70° west. On the 10th the gale of the preceding day continued, with high sea, being reported from 41° 44′ north, 59° west; 41° north, 56° west; 36° north, 70° west, and 40° north, 70° west. On the 12th, a terrific gale in the Prince Edward Islands; 13th gale with high sea, 41° north, 62° west; 14th, gale with high sea, 49° north, 37° west; 15th, heavy gale and very high sea, 48° north, 37° west; also 41° north, 72° west; 16th, heavy northeast gale, veering to northwest on the Middle and East Atlantic coast. At Saint John, New Brunswick, the storm of the 16th and 17th was the severest of the season; wind-gusts of fifty miles and heavy snow, with great fall in temperature, were reported; 18th, heavy gale and high sea, 46° north, 48° west; 19th, heavy gale, 45° north, 53° west; hurricane, 34° north, 74° west; also a gale, 31° north, 43° west; also heavy northwest gale off the Middle Atlantic coast; 24th, heavy northwest gale, 34° north, 74° west; 26th, heavy northwest gale, 48° 17′ north, 34° 50′ west; also at 47° 31′ north, 37° 30′ west; 29th, northeast gale veering to southwest, 26° north, 71° west; also a heavy northeast gale veering to southwest, and at times blowing with hurricane force; twenty miles southeast of Absecom, a cyclone was encountered between New York and Bermuda by the bark Elila Brass; 30th, heavy southwest gale off Cape Fear river-bar; 31st, heavy northeast gale and snow-storm off the New Jersey coast.

TEMPERATURE OF THE AIR.

In general.—The general distribution of the temperature for the month is shown by the isotherms on Chart No. II, from which it appears that the temperatures have, on the Pacific Coast, been somewhat above the average. At the stations in the Rocky Mountains the deviations were: Salt Lake City, 3°; Cheyenne, 3°.9; Denver, 1°.7; Santa Fé, 2°; all below the average. East of the Rocky Mountains, and for altitudes less than 5,000 feet, the temperatures everywhere have been much below the average.

The maximum temperatures above 70° have been as follows: Corsicana, 72°; Denison, 72°; Galveston, 70°; Indianola, 75°; Jacksonville, 71°; Key West, 87°; Montgomery, 70°; New Orleans, 72°; San Diego, 77°; Shreveport, 70°; Boerne, Tex., 71°; and the maxima lower than 40° have been, at Alpena, 38°; Duluth, 39°; Escanaba, 36°; Marquette, 37°; Pembina, 35°; Pike's Peak, 27°; Port Huron, 40°. The maximum temperatures for the month generally occurred from the 11th to the 14th at most of the stations east of the Rocky Mountains, during the movement of storms Nos. IV, V, VI, and VII.

Minimum temperatures below —20° are as follows: Bismarck, —23°; Breckenridge, —23;

Denver, —25; Duluth, —30; Fort Sully, —26; La Crosse, —24; North Platte, —25; Pembina, —49; Pike's Peak, —21; Saint Paul, —27. The minimum above +20° have been Charleston, 23; Galveston, 26; Indianola, 23; Jacksonville, 24; Key West, 45; Mobile, 21; New Orleans, 28; Portland, Oreg., 24; San Diego, 43; San Francisco, 42; Savannah 20, and Tybee Island 25. The minimum temperatures have attended the progress of areas of high pressure and clear, dry weather, as given in the previous chapter. The principal epochs of low temperature have been as follows: 1st in Florida; 2d, Georgia, South Carolina and Florida; 3d, Florida; 4th, Florida; 6th, Georgia, Florida; 7th and 8th, Dakota, Missouri; 9th, Illinois, Ohio, Iowa, Minnesota, Indiana, Tennessee, Wisconsin, Kentucky; 10th, New Jersey, Maryland, North Carolina, Ohio, Michigan, Pennsylvania, Virginia, West Virginia, New York, District of Columbia; 11th, California; 14th, Utah; 15th, California; 16th, Michigan, New York, Minnesota, Oregon; 17th, New York, Michigan, Massachusetts, Vermont, New Jersey, Maine, Connecticut, Rhode Island, California; 18th, Utah, California; 23d, California, Montana, Texas; 24th, Wyoming Territory, Colorado, New Mexico; 25th, New York, Wyoming Territory, Texas, Massachusetts; 26th, Dakota, Kansas, Nebraska; 27th, Dakota; 28th, Colorado; 29th, Dakota, Texas, Kansas, Nebraska; 30th, Minnesota, Illinois, Dakota, Indian Territory, Tennessee, Georgia, Alabama, Mississippi, Louisiana, Nebraska; 31st Tennessee.

Ranges of temperature.—The largest ranges of temperatures for the month have been: Denver, 93°; North Platte, 87°; Dodge City and Pembina, 84°; Fort Sully, 82°; Fort Gibson, 77°; Breckenridge, 75°; Yankton, 72°; Leavenworth and Duluth, 69°; Saint Paul, 68°; Bismarck Denison, Keokuk, La Crosse and Viginia City, 67°. The smallest ranges have been: San Francisco, 22°; Portland, Oreg., and Salt Lake City, 32°; San Diego, 34°; Tybee Island, 38°; Buffalo, Charleston, Key West, and New Orleans, 42°; Cape Lookout, Sandy Hook, and Smithville, 43°; Atlantic City, Barnegat, and Galveston, 44°.

Frosts have occurred as far southward as the Gulf States in every day of the month except the following: 8th, 11th, 14th, 21st, 22d, 23d, and 24th. The first period of cold, which continued from the 1st to the 6th is especially reported on by the observer at Punta Rassa, according to whom, at that place, scarcely anything escaped being injured by the cold. Large quantities of fish, of all sizes and kind, were killed by the cold water and cast up on the beach daily. Snow fell for about five minutes on the morning of the 1st. Within a region of fifty miles radius frost occurred nearly every day.

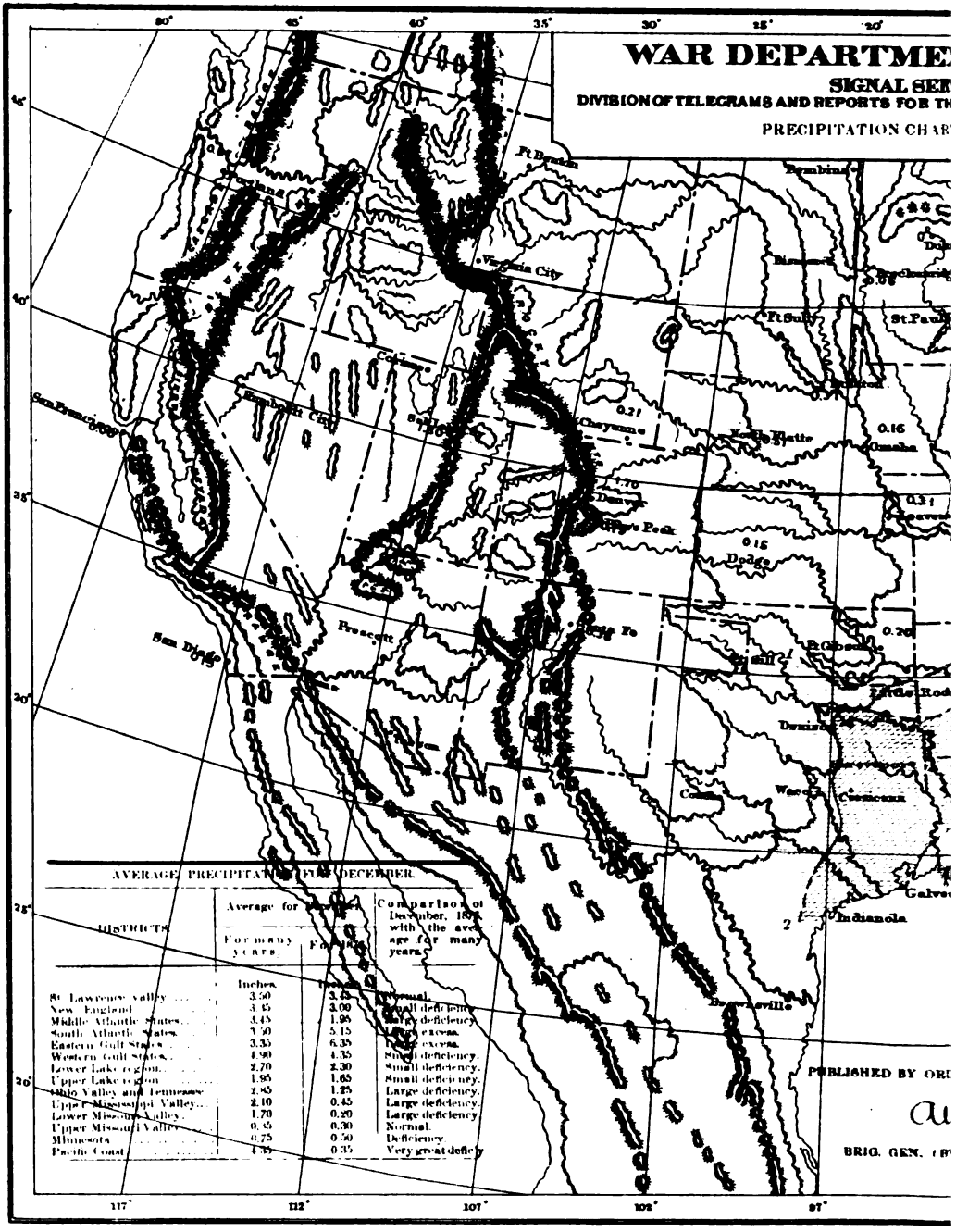
PRECIPITATION.

In general.—The distribution of the total amount of rain or melted snow for December is shown upon Chart No. III. The great irregularity in snow-fall and its drifting by the wind, as well as the want of uniformity in methods of measuring the dry and the melted snow, render the isohyetal lines open to some doubt; but, in general, it appears that less than an inch fell in Minnesota, Iowa, Illinois, and westward to the Rocky Mountains, producing a large deficiency in this region as compared with normal values. The deficiency is also quite decided in the Ohio Valley and Tennessee and for the Middle Atlantic States A small deficiency is reported from the Upper and Lower Lake regions, Minnesota, New England and the Western Gulf States, but a large excess has fallen in the Eastern Gulf and South Atlantic States. The deficiency in New England and the Middle Atlantic States was to a large extent made up for by the storm of January 1, 1877. The most remarkable feature of the map is the remarkable deficiency in Oregon and California. The normal values for these regions are approximately as follows: San Diego, 2 inches, San Francisco, 5 inches, and Portland, Oreg., 7 inches. These notable deficiencies are to be taken in connection with the high temperature and the high barometric pressures that have also prevailed there.

Stations reporting no rain during month.—No rain at all is reported from four stations in the immediate neighborhood of San Francisco, Cal., as also from Fort Clarke, on the Rio Grande, Texas. Numerous stations report one-tenth inch of rain, or less, near the boundary between Kansas and Nebraska.

Stations reporting heavy rains or snow are as follows: Cape Lookout, 6.15; Jacksonville, 6.15; Mobile, 7.18; New Orleans, 9.57; Saint Mark's, 8.51; Baton Rouge, 2 inches of rain fell from noon to 10 p. m. of the 31st. *Heavy snows* were reported as follows: Monticello, Ark., 28th, 7 inches; 31st, 21 inches; Lenore, N. C. 24th and 25th, 11 inches; Spartanburg, S. C., 23d, 24th, and 25th, 10 inches; McMinville, Tenn., 28th and 29th, 14 inches; heaviest snow ever known; Raleigh, N. C., 25th, 13 inches; heaviest snow-storm ever known in that vicinity; Memphis, Tenn., 28th, 8¼ inches; Shelbyville, Tenn., 28th, the heaviest snow-fall since the 15th and 16th of May, 1843, when the fall was 21 inches, and very uniform. The observer at Hiwassie College, Tennessee, reports that the snow-fall of December 31 and January 1 amounted in 17 hours to 20 inches, being the most remarkable snow-fall known to the inhabitants.

Total snow-fall for month.—Arkansas, 12 to 28 inches; Connecticut, 11 to 38; Colorado, 4; Dakota, 5; Delaware, 4½; Georgia, 1; Illinois, 2 to 26; Indiana, 3 to 24; Iowa, 2 to



AVERAGE PRECIPITATION FOR DECEMBER.

DISTRICTS.	Average for December. For many years.	Average for December. For 1882.	Comparison of December, 1882, with the average for many years.
	Inches.	Inches.	
St. Lawrence valley	3.50	3.45	Normal.
New England	3.45	3.00	Small deficiency.
Middle Atlantic States	3.45	1.98	Large deficiency.
South Atlantic States	5.50	5.15	Large excess.
Eastern Gulf States	3.35	6.35	Large excess.
Western Gulf States	4.90	4.35	Small deficiency.
Lower Lake region	2.70	2.30	Small deficiency.
Upper Lake region	1.95	1.65	Small deficiency.
Ohio Valley and Tennessee	2.85	1.25	Large deficiency.
Upper Mississippi Valley	2.10	0.45	Large deficiency.
Lower Missouri Valley	1.70	0.20	Large deficiency.
Upper Missouri Valley	0.45	0.30	Normal.
Minnesota	0.75	0.50	Deficiency.
Pacific Coast	4.75	0.35	Very great deficiency.



HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, DEC., 1878.

STATIONS.	Danger point on gauge.	HIGHEST WATER.		LOWEST WATER	
		Date.	Height.	Date.	Height.
RED RIVER.	ft. in.	Dec.	ft. in.	Dec.	ft. in.
Shreveport	29 9	1	6 9	28	4 6
MISSOURI.					
Fort Sully †		—	—	—	—
Yankton †	20	—	—	—	—
Omaha †	16	18	2 10	7to1	1 7
Leavenworth †	21	—	—	—	—
MISSISSIPPI.					
St. Paul †	14 6	—	—	—	—
La Crosse †	18	—	—	—	—
Dubuque †	21 10	—	—	—	—
Davenport †	15	—	—	—	—
Keokuk †	14 6	13	6 9	7	1 11
St. Louis	30	5	14 2	9	4 9
Cairo	40	2	12 4	30	6 3
Memphis	34	5	9 2	31	2 1
Vicksburg	41	9	13 1	31	3 11
New Orleans *	7 6	1	13 8	30	16 2
CUMBERLAND.					
Nashville	42	1	3 10	22, 23	2 0
OHIO.					
Pittsburgh	25	1	4 9	12	2 1
Cincinnati	30	21to23	14 1	14	2 11
Louisville	24	1	7 5	13	4 1
GARONNE.					
Agen	—	25	13 11	10, 20	4 11

* Below low-water mark. † River frozen during all or nearly all of

DER OF THE SECRETARY OF WAR.

Asst. A. Myer

ASS'T) CHIEF SIGNAL OFFICER, U. S. A.

8; Kansas, 1 to 7; Kentucky, 10 to 14; Louisiana, 12; Maine, 32 to 43; Maryland, 8 to 15; Massachusetts, 12 to 36; Michigan, 15 to 24; Missouri, 1 to 4; Nebraska, 1 to 5; New Hampshire, 39 to 42; New Jersey, 6 to 18; New York, 7 to 10; North Carolina, 6 to 26; Ohio, 8 to 42; Pennsylvania, 4 to 28; Rhode Island, 18; Tennessee, 17 to 29; Texas, 8; Utah, 10; Vermont, 18 to 55; Virginia, 4 to 18; West Virginia, 28; Wisconsin, 3 to 21.

Rainy days.—The number of days during the month on which some rain or snow fell is as follows: Alpena, 27; Buffalo, 26; Cleveland, 25; Detroit, 21; Erie, 25; Grand Haven, 22; Morgantown, 21; Oswego, 25; Pittsburgh, 22; Port Huron, 27; Rochester, 27; Toledo, 21; from which it will be seen that in the Lake region the precipitation has been remarkably frequent. The number of days on which precipitation has occurred in the remaining districts is as follows: New England, 9 to 18; Middle Atlantic States, 6 to 14; South Atlantic States, 9 to 13; Gulf States, 6 to 18; Ohio Valley and Tennessee, 5 to 15; Northwest, 3 to 17; Rocky Mountain stations, 5 to 11.

Cloudy days.—The number of days on which the cloudiness has equaled eight on a scale of ten, as reported by voluntary observers, ranges as follows: New England, 6 to 25; Middle States, 4 to 25; South Atlantic States, 4 to 13; Gulf States, 5 to 17; Ohio Valley and Tennessee, 6 to 20; Upper Lake region, 15 to 22; Northwest, 1 to 13.

Droughts.—A scarcity of water is reported from some portions of the Middle States, New England and the Northwest, owing to the continued cold weather, which has prevented the snow from melting. The lack of rain in California has caused some apprehensions on the part of farmers that agricultural interests may suffer.

RELATIVE HUMIDITY.

The mean relative humidity for the month, as reported from the Signal-Service stations, ranges as follows: in New England, 69 to 78 per cent.; Middle Atlantic States, 66 to 80; South Atlantic States, 62 to 74; Gulf States, 57 to 74; Indian Territory, Arkansas and Tennessee, 55 to 72; Lower Lake region, 72 to 80; Upper Lake region, 61 to 79; Ohio Valley and Northwest, 64 to 74; Cheyenne, 66; Denver, 51; Pike's Peak, 65; Santa Fé, 46; Virginia City, 62; Salt Lake City, 89; Portland, Oreg., 82; San Francisco, 66; San Diego, 58. The unusually moist atmosphere at Salt Lake City was accompanied by a dense fog, which hung over the station almost continually from the 5th until the 20th.

WINDS.

Prevailing winds.—These are shown by the arrows on Chart No. II. They have very generally been from N., NW. or W. over the entire country from the Rocky Mountains eastward to the Atlantic, except in Tennessee and the Ohio Valley, where they have been more variable.

Total movement of the air.—The following are the largest total movements of the air as recorded at the Signal-Service stations: Pike's Peak, 19,641 miles; Cape May, 16,407; Sandy Hook, 14,954; Thatcher's Island, 13,669; Kittyhawk, 12,166; Cape Lookout, 11,737; Barnegat, 11,445; Erie, 11,289; Grand Haven, 10,209; Wood's Holl, 10,168. The smallest movements have occurred at the following stations: Salt Lake City, 1,636 miles; Nashville, 2,648; Virginia City, 2,684; Portland, Oreg., 2727; Dubuque, 2,854; San Diego, 3,079; San Francisco, 3,115; Shreveport, 3,326.

Highest winds.—Among the highest hourly wind velocities reported from Signal-Service stations are the following; Boston, 29th, E. 57; Buffalo, 15th, W. 60; Bismarck, — 64; Cape May, 9th, W. 72, 17th, NW. 60; Eastport, 18th, SE. 54, 29th, E. 69; Erie, 16th, W. 52; Grand Haven, 15th, SW. 66; Knoxville 8th, SW. 54; Malone, 15th; S. 52; Marquette, 9th, W. 54; Milwaukee, 15th, W. 54; Morgantown, 8th, W. 54; New York, 9th, W. 60, 16th, NW. 60; Newport, 9th, SW. 60; Pembina, 15th, NW. 54; Pike's Peak, 7th, — 66, 29th, — 90; Sandy Hook, 9th, W. 84, 16th, NW. 63, 18th, NW. 60, 30th, W. 68; Thatcher's Island, 29th, E. 60. The observer at Detroit reports that during the storm of the 15th and 16th, in which the wind attained a maximum velocity of 35 miles per hour from the W., the changes in pressure and temperature were unprecedented in respect to magnitude and rapidity. A fall in pressure of .20 of an inch was recorded in two hours, followed by a rise of .86 in eight hours. The temperature rose 17° in eight hours, and subsequently fell 32° in the same interval. The approach of this storm was fully anticipated by the cautionary signals. The high winds accompanying low barometer No. V appear to have been very severe in Newfoundland. According to reports from Saint John's falling barometer and gales continued throughout the 13th, the barometer falling to 28.60 at 9 a. m. A *water-spout* was observed at Wilmington, N. C., on the 29th, at 8 a. m. At Augusta, Illinois, a violent *whirlwind* occurred on the 8th, at 9 a. m.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily weather indications with the telegraphic reports for the succeeding twenty-four hours shows a percentage of verifications of 88.1, and a percentage of omissions of 0.9 in detail. The percentages have

been as follows: for weather, 95.2; wind, 86.6; temperature, 85.6; barometer, 85.0. The geographical distribution of the verifications has been as follows: New England, 88.9; Middle States, 90.2; South Atlantic, 90.4; Eastern Gulf States, 89.0; Western Gulf States, 87.8; Lower Lake region, 89.3; Upper Lake region, 88.1; Tennessee and the Ohio Valley, 90.0; Upper Mississippi Valley, 85.1; Lower Missouri Valley, 80.2.

Cautionary signals.—There have been displayed during the month at United States signal-stations 192 cautionary storm-signals; of these 142 were justified at the stations, and nineteen others, or 83 per cent. in all, justified within a hundred miles of the stations. Thirty were not justified. Seventy-four cases are reported in which signals were needed but not displayed.

NAVIGATION.

Height of rivers.—The highest and lowest readings on the Signal-Service river-gauges are given in the table on Chart No. III; from which it appears that the Red River, at Shreveport, and the Mississippi, from Cairo to New Orleans, were highest during the first ten days of the month and lowest at its close. At Cairo, the lowest reading of the month was on the 30th, when the river was only 3 inches above the low-water mark of December, 1861. In the Ohio and tributaries, the lowest waters occurred about the middle of the month.

Ice in rivers is reported as follows: *Mississippi River*—Davenport, closed 2d; men crossed 4th; teams, 10th; Saint Louis, navigation interrupted 2d; river gorged 4th; navigation resumed 7th; suspended 9th; river frozen over 11th; Cairo, navigation suspended to points above on the 2d; and to points below, 23d; Keokuk closed 16th; Nashville, ice in river 19th, 20th, 30th, and 31st; Memphis, river gorged 30th; La Crosse, ice averages 19 inches in thickness, and some was cut 31 inches thick, on the 31s. *Missouri River*—At Lower Brulé agency, closed 1st; Leavenworth, frozen at shore during month, and after the 20th channel closed; Plattsmouth, Nebr., closed 3d; Saint Joseph, Mo., ice-bridge 5th. *Ohio River*—Cincinnati, navigation closed 9th, and river frozen over 10th; Laconia, Ind., full of floating ice 9th; Louisville, Ky., navigation suspended 9th, river gorged 15th; Pittsburgh, frozen over 10th; Portsmouth, Ohio, gorged 10th.

For other places the following notes have been received: On the 1st, Albany, N. Y., Erie Canal closed; Lyndon, Ill., Rock River closed; Logansport, Ind., Wabash and Eel rivers frozen over; Alpena, Mich., Thunder Bay river frozen over (and harbor frozen 8th); Chicago, Ill., navigation closed; 2d, Monticello, Iowa, Maynoketa river frozen over; Trenton, N. J., Delaware and Raritan Canal frozen over; Cincinnati, Miami Canal closed; 3d, Shelburne, N. H., Androscoggin crossed by pedestrians (and on 10th by teams); 4th, Trenton, N. J., Delaware river frozen over; 5th, New Geneva, Pa., on account of ice, boats stopped running; 6th, Buffalo, N. Y., navigation closed; 8th, Decatur, Ill., Sangamon river frozen over; 9th, Philadelphia, Pa., Schuylkill and Delaware rivers frozen over (ice-gorges in Delaware 17th and 27th); Morgantown, W. Va., Monongahela river frozen over; Knoxville, Tenn., Holston river closed 9th (first time in thirteen years); 10th, Bloomfield, Wis., Geneva Lake frozen over; Bangor, Me., and Erie, Pa., navigation closed; 12th, Washington, D. C., Potomac closed; 15th, Salem, N. J., Salem creek closed (ice 10 inches thick 31st); Detroit, Mich., navigation closed (ice in river 4th to 12th, gorged 12th); 16th, Grand Haven, Mich., navigation closed; 17th, Cooperstown, N. Y., Otsego Lake closed; Port Huron, Mich., Black River frozen, and an ice-bridge across the Saint Clair; 18th, Asheville, N. C., the French Broad river was crossed on ice by cattle, &c., for several days about this date. This is the first time that this has ever occurred within the knowledge of the observer. 19th, Fall River, Mass., Taunton river and Narragansett Bay frozen over; 20th, West Point, N. Y., large masses of floating ice; Wappinger's Falls, N. Y., navigation on Hudson ceased; 25th, Standish, Me., Sebago Lake frozen; has not been known to freeze *with the water so low* since 1838.

TEMPERATURE OF WATER.

The maximum and minimum temperatures at the bottom of the water are given in the table on Chart No. II. The highest maxima are: Charleston, 53°; Jacksonville, 54°; Mobile, 55°; Saint Mark's, 50°; Punta Rassa, 72°; Key West, 84°, which unusually high temperature was observed on the 24th. The lowest maxima are: Omaha, 32°; Saint Louis and Milwaukee, 33°; Grand Haven and Marquette, 34°; Chicago, Duluth, and Knoxville, 36°.

Minimum water temperatures.—The lowest are: New York, 28°; Escanaba, 29°; Portland, Me., Wood's Holl, 30°; Baltimore and Memphis, 31°. The highest minima are: Saint Mark's, 54°; Punta Rassa, 52°; Key West, Jacksonville, and Mobile, 45°; Charleston, 43°; Savannah, 41°.

Ranges of water temperatures.—The largest ranges of water temperature during the month are the following: Key West, 39°; Punta Rassa and Baltimore, 14°; Springfield, Norfolk, and Wilmington, 11°; Augusta, Charleston, Mobile, New York, and New London, 10°. Smallest ranges: Omaha, 0°; Saint Louis, 1°; Knoxville and Duluth, 3°; Keokuk and San Francisco, 4°.

Ocean temperatures.—December 28, bark Speranza, in lat. 38° 19′ N., 71° 10′ W., found the temperature of the water 68°; after two hours, 75°; and one hour subsequently, 76°. All at once found the water riffling with a very heavy swell, and supposed it to be the boundary of the Gulf Stream, as six miles in a NW. direction found the water only 55°.

ATMOSPHERIC ELECTRICITY.

Thunder and lightning storms have occurred as follows: 8th and 9th, New London, Conn.; 17th, Galveston, Tex., Point Pleasant, La.; 18th, Newport, R. I., New London and Mystic, Conn., Dover, Del., New Orleans, La., Mendon, Billerica, Westborough, Fall River, Waltham, and Boston, Mass., Brookhaven, Miss., Vineland, N. J.; 28th, Galveston, Tex., Wilsonville, Ala.; 31st, Indianola and Austin, Tex.

Auroras were observed as follows: 4th, Yankton, Dak.; 10th, Boston, Quincy, and Somerset, Mass., Duluth, Minn., Cresco, Iowa, Cornish and Gardiner, Me., Newport, Vt., Waupaca, Wis.; 11th, La Crosse, Wis., Cresco, Iowa, Gardiner, Me.; 13th, Eastport, Me.; 16th, Dodge City, Kans.; 17th, Duluth, Minn., Malone, N. Y., Gardiner, Me.; 18th, Austin, Tex.; 19th, Auburn, N. H.; 21st, Escanaba, Mich.; 23d, Egypt, Pa. At Attaway Hill, N. C., from 10 p. m. of the 22d to sunrise of the 23d, a peculiar reddish glow was observed in the northeast. At Carthagena, Ohio, shortly after the passage of the great meteor, on the evening of the 21st, the observer noticed a reddish glow in the northeast which lasted a few minutes.

Telegraphic ground currents—The observer at Detroit reports that, in connection with the great storm of the 16th, the operators of the Western Union Telegraph Company worked the lines without a battery, during a portion of the nights of the 15th and 16th. At this time clear weather, low temperature, and northwest gales prevailed immediately west of Detroit, while southwesterly winds, warmer, cloudy, and snowy weather prevailed to the eastward.

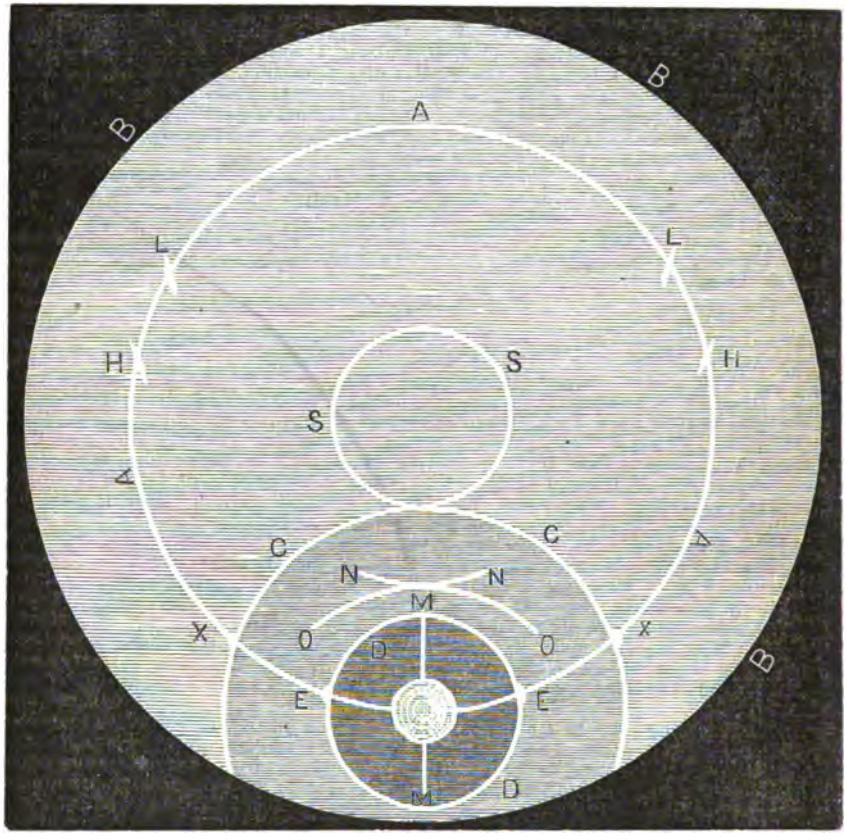
OPTICAL PHENOMENA.

Solar halos were noted as follows: 1st, Illinois, Michigan, New York, Wisconsin; 2d, Delaware, Iowa, Maine, New York; 3d, Maine, New Hampshire; 4th, Illinois, District of Columbia, Tennessee; 5th, Mississippi, New York, Texas; 6th, Iowa, Nebraska, Tennessee; 7th, Illinois, Indiana, Kentucky, Massachusetts, New York, Ohio, Tennessee; 8th, Dakota, Indiana, New York, Ohio, Pennsylvania; 9th, Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Ohio, Pennsylvania, Tennessee; 10th, Dakota, Michigan, Minnesota, New Hampshire, New York, Pennsylvania; 11th, New York; 12th, Minnesota, New York; 13th, New Hampshire, New York, Ohio, Tennessee; 14th, Indian Territory, Iowa, Minnesota, New Jersey, New York, Ohio; 15th, Mississippi; 16th, Illinois, Indiana, Iowa, Massachusetts, Tennessee, Wisconsin; 17th, Dakota, Maryland, New York, Wisconsin; 18th, Minnesota, Tennessee, Wisconsin; 19th, Minnesota, Nebraska, Ohio, Pennsylvania, Tennessee; 20th, Illinois, Iowa, Massachusetts, Ohio; 21st, Illinois, Iowa, Michigan, New York, Ohio, South Carolina; 22d, Kansas, Texas, Wisconsin; 23d, Colorado, Iowa, Minnesota, Nebraska, New Jersey, Wisconsin, Wyoming; 24th, Dakota, Illinois, Kansas, Michigan, Minnesota, New Jersey, New York; 25th, New Hampshire, New York; 26th, Iowa, Kansas, Nebraska; 27th, Iowa, Kansas, Minnesota, Nebraska; 28th, Dakota, Massachusetts, Nebraska, New Hampshire, New York, Pennsylvania, Wisconsin; 29th, Iowa, Missouri, Nebraska; 30th, Illinois, Iowa, Minnesota; 31st, Minnesota.

A very interesting solar halo was observed at Denver during the 23d. (See diagram on next page.) It consisted essentially of two concentric circles (DD and CC), surrounding the sun, of 22° and 46° radii, respectively; two other concentric circles (SS and AA) around the zenith, whose radii varied with the altitude of the sun, but were at midday, respectively, about 15° and 60° (SS and CC were tangent to each other; there were also segments OO and NN) of circles, centered, respectively, at the sun and zenith, and tangent to each other; these circles had the same radii, namely, about 30°; there was also a well-defined vertical column (MM) extending through the sun as a diameter to the circle (CC). At the intersections of all these circles the mock-suns or sun-dogs were seen, and also at other points (L, L, H, H), to the number of eight in all. The whole display steadily increased in brilliancy from sunrise until 9.40 a. m. It continued at its maximum brilliancy until 11.50 a. m., and was still beautiful at 2 p. m. That portion of the zenithal circle (SS) which lay nearest the sun was a strikingly brilliant rainbow, the red being nearest the sun, and all its glowing colors were very clearly defined. The spectacle was the admiration of the entire population. The solar halo, observed on the 10th, at Pembina, between 7 and 9 a. m., seems to have been of nearly equal brilliancy. The circles (DD, CC, and AA), and the rainbow segment of (SS), and the vertical column (MM), and four of the attending mock-suns were well seen.

Lunar halos were noted as follows: 1st, Alabama, Dakota, District of Columbia, Iowa, Maine, Maryland, Michigan, New Jersey, New York, Ohio; 2d, Alabama, Connecticut, District of Columbia, Illinois, Indiana, Iowa, Maryland, Minnesota, New Hampshire, New Jersey, New York, North Carolina, Ohio, Rhode Island, Tennessee, Wiscon-

sin; 3d, Iowa, Maine, North Carolina, Tennessee; 4th, California, Delaware, Maine, New Jersey, Ohio; 5th, District of Columbia, Tennessee, Wisconsin; 7th, District of Columbia, Florida, Illinois, Indiana, Nebraska, Ohio, Vermont; 8th, District of Columbia; 9th, Ohio; 10th, District of Columbia; 12th, New Jersey; 14th, Minnesota; 19th Dakota. Indiana; 20th, Georgia, Kansas, Missouri, New Jersey, New York, West Virginia, Virginia; 21st, Florida, Illinois, Iowa, Kansas, Maine, New York, North Carolina, Ohio; 22d, Alabama, Arkansas, Georgia, Iowa, Kansas, Mississippi, Nebraska, Ohio, Tennessee, Texas, Wisconsin; 23d, Connecticut, Dakota, Delaware, District of Columbia, Iowa, Maryland, Massachusetts, Minnesota, Nebraska, New Jersey, Ohio, Pennsylvania, Utah, Virginia; 24th, Connecticut, Dakota, Iowa, Massachusetts, Michigan, Minnesota, New Jersey, New York, Rhode Island, Texas; 25th, Indiana, Minnesota, Nebraska, Wyoming; 26th, Colorado, Iowa, Maryland, Nebraska, Texas, Virginia; 27th,



Colorado, Delaware, District of Columbia, Iowa, Maryland, Nebraska, New Jersey, North Carolina, Pennsylvania, Tennessee, Virginia, Wisconsin; 28th, Dakota, District of Columbia, Indiana, Iowa, Maine, Massachusetts, Nebraska, New Hampshire, New Jersey, New York, Rhode Island, Vermont, Wisconsin; 29th, Colorado, Dakota, Indiana, Iowa, Kansas, Michigan, Nebraska, Tennessee; 30th, Alabama, Illinois, Indiana, Iowa, Kansas, Maine, Massachusetts, Minnesota, Nebraska, New York, Pennsylvania, Tennessee, Wisconsin; 31st, Georgia, Illinois, Indiana, Iowa, Minnesota, Michigan, New York, Ohio, Pennsylvania, Tennessee, West Virginia.

Mirage.—3d, Breckenridge, Minn.; 4th, 26th, and 27th, Great Bend, Kan.; 11th and 13th, Tybee Island, Ga.

MISCELLANEOUS PHENOMENA.

Polar bands were observed as follows: 1st, Breckenridge, Minn.; 4th, Detroit, Mich., Duluth, Minn.; 5th, Duluth, Minn., Dubuque, Iowa; 6th, Iowa City, Iowa, Carthagena, Ohio, Plattsmouth, Neb.; 7th, Guttenburg, Iowa; 8th, Auburn, N. H.; 10th, Eastport, Me.; 11th, Tybee Island, Ga.; 13th, Carthagena, Ohio, Wytheville, Va.; 14th,

Danville, Ky., Carthagena, Ohio; 15th, Freehold, N. J., Carthagena, Ohio; 16th, Tabor, Iowa, Carthagena, Ohio; 17th, Gardiner, Me.; 19th, Dubuque, Iowa; 21st, Danville, Ky., Wytheville, Va., Tybee Island, Ga.; 22d, Iowa City, Iowa; 23d, Danville, Ky., Carthagena, Ohio; 25th, Gardiner, Me.; 27th, Wytheville, Va.; 28th, Iowa City, Iowa, Auburn, N. H.; 29th, Iowa City, Iowa; 30th, Iowa City, Iowa; 31st, Wytheville, Va., Tybee Island, Ga.

Zoological.—*Wild geese* were seen at Nashville, flying south, on the 17th; Saint Louis, Mo., north, on the 21st; Laconia, Ind., south and southeast, on the 20th and 21st; Creswell, Kans., northeast, on the 7th; Fall River, Mass., southwest, on the 8th. *Wild ducks* were seen at Laconia, Ind., flying south and southeast, on the 20th and 21st. *Swans* were seen at Baltimore, Md., on the 4th. *Crows* were seen at Baltimore, Md., flying south on the 30th and 31st.

Prairie Fires.—4th, Pike's Peak; 6th and 8th, Creswell, Kans.; 12th, Fort Gibson, Ind. T.; 13th, Fort Randall, Dak.; 15th and 18th, Oregon, Mo.

Zodiacal light.—8th, Oregon, Mo.; 13th, 14th, 16th, and 18th, Bellfontaine, Ohio; 16th, Nashville, Tenn.

Earthquake.—A slight shock was felt in the west end of the city of Charleston on the evening of the 12th, windows rattled, and the usual evidences of such convulsions were plainly felt. Wytheville, Va., an earthquake shock, 10.30 a. m., 21st, is reported.

Meteors.—1st, Pennsylvania, Texas; 2d, Texas; 4th, Illinois, Ohio; 5th, New Jersey, Pennsylvania; 6th, Illinois, New York, Pennsylvania; 7th, Iowa, Maryland, New York; 8th, Kentucky, Michigan; 9th, Maryland; 10th, Illinois, Iowa, Missouri; 11th, Iowa, Kansas, Missouri; 12th, Georgia, Missouri, West Virginia, Wisconsin; 13th, Iowa, Missouri; 14th, North Carolina, Ohio; 15th, Kansas, New York, Vermont; 16th, District of Columbia; 17th, California; 18th, Illinois, North Carolina, Texas; 19th, Texas; 20th, Kansas; 21st, Illinois, Indiana, Iowa, Kansas, Minnesota, Missouri, Nebraska, Ohio, West Virginia; 22d, Kansas; 24th, Texas; 30th, Pennsylvania; 31st, Florida, Texas.

The great meteor of the evening of the 21st was one of the most remarkable that has lately been recorded in the United States. Reports concerning it have been received from about 120 stations. From a brief study of these, it becomes apparent that the meteor entered the earth's atmosphere somewhere over or west of Kansas or Nebraska. Its true course was nearly due east, and it was last seen over the State of New York. Its visible track, as projected upon the earth, is therefore over a thousand miles long. The times of its appearance and disappearance, as noted by the observers, are extremely discordant. The average of about 45 observations, pretty uniformly distributed along its course, gives 9 hours 26 minutes as the Washington mean time, which may, therefore, represent the moment when it was at the middle of its visible path. No definite conclusion can be satisfactorily arrived at, with reference to its actual velocity in miles, from a comparison of the records of distant observers; but the observations of the individual observers, taken by themselves, give velocities relative to the earth's surface of between 1 and 5 miles per second, or 2 to 5 miles relative to the earth's center; and as the meteor was overtaking the earth in its annual orbit, its velocity in space relative to the sun was 20 to 25 miles, its movement being toward a point in latitude 20°, longitude 35°, with reference to the plane of ecliptic. When first seen the meteor appeared to be as large as the moon, but much brighter. In passing over Indiana its main body divided into two portions, and one of these subsequently broke into a hundred fragments, which at first kept together in one cluster, but gradually fell behind each other, forming a long train in single file, and as such passed over Ohio into New York. The brightness of the meteor was everywhere described as far surpassing bright moonlight. No reliable accounts speak of any noise heard during the visibility of the meteor; but in from two to five minutes after its passage, a shock resembling thunder was heard, which in the majority of cases was described as tremendous, shaking the ground and the houses, and was especially alarming to those who, on account of the prevailing cloudiness, were unable to see the preceding meteor. The uniform character of the sound heard at all stations shows that it was not due to any violent explosion (properly so-called), but was a peculiar acoustic phenomena, depending on the fact that that portion of the line described by the meteor when nearest to any observer, became, as it were, instantaneously along a length of several miles, the origin of a series of simultaneous sounds which, although in themselves comparatively feeble, were concentrated into a violent sound when they reached the observer's ear. No records have come to hand of the finding of any fragments of this meteor, nor is it likely that any of any size fell to the earth, as the main body evidently passed out of the atmosphere when over New York, and the smaller fragments or sparks that were seen to fly off were rapidly burned up and disappeared in its train.

Published by order of the Secretary of War.

ALBERT J. MYER,
Brig. Gen. (Brevet Assigned), Chief Signal Officer, U. S. A.

PAPER 32.

MONTHLY WEATHER REVIEW, JANUARY, 1877.

INTRODUCTION.

In compiling the present Review, the usual data received up to February 14 have been made use of. The most noticeable features for the month are: The severe coast storm of the 1st and 2d; the increasing severity of storms as they approached the Gulf of Saint Lawrence; the continuance of the cold weather of December until after the middle of January, giving low average temperatures for the districts east of the Rocky Mountains; generally, a deficiency in the precipitation; the destructive ice-gorges in Ohio and Monongahela Rivers; the closing of many harbors by ice, from the Potomac northeastward, until after the middle of the month.

BAROMETRIC PRESSURE.

The general distribution is represented upon Chart No. II. The highest reading for the month, 30.91 inches, was observed at Breckenridge, night of the 11th, during the advance of high pressure No. III; lowest, 28.76 inches, at Sydney, 11 p. m., 2d. The average of the barometric readings at Fort Sully is 30.16 inches.

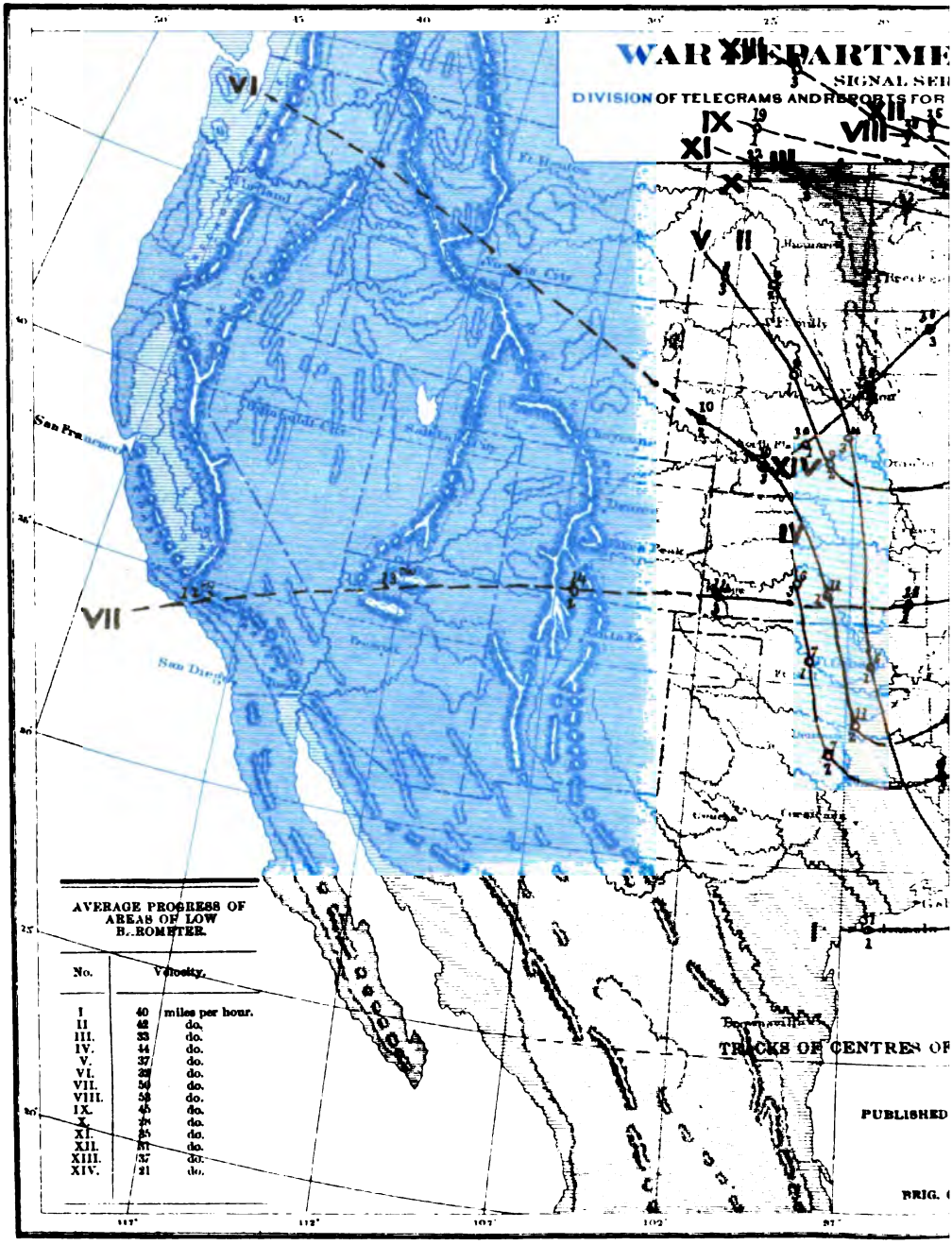
Ranges in barometer.—Portland, Oreg., 0.95 inch; San Francisco, 0.81; San Diego, 0.41; Rock Mountain stations, 0.65 to 1.54; plains of Nebraska and Kansas, 1.39 to 1.56; Northern Texas and Indian Territory, 1.10 to 1.24; Missouri Valley, 1.14 to 1.31; Red River of the North Valley, 1.29 to 1.38; Upper Mississippi Valley, 0.90 to 1.27; Upper Lake region, 0.87 to 1.35; Lower Lake region, 1.03 to 1.28; Ohio Valley and Tennessee, 0.98 to 1.24; New England, 1.42 to 1.75; Middle States, 1.05 to 1.49; South Atlantic States, 0.66 to 1.16; Gulf States, 0.75 to 1.10; Key West, 0.51.

Areas of high pressure.—During the first part of the month they were more frequent than during the last part. The high-pressure area, designated as No. IX in the December review, and central over Tennessee, on the morning of the 31st, covered the Middle States, morning of the 1st, but with diminished pressure, after which it rapidly disappeared in advance of No. I.

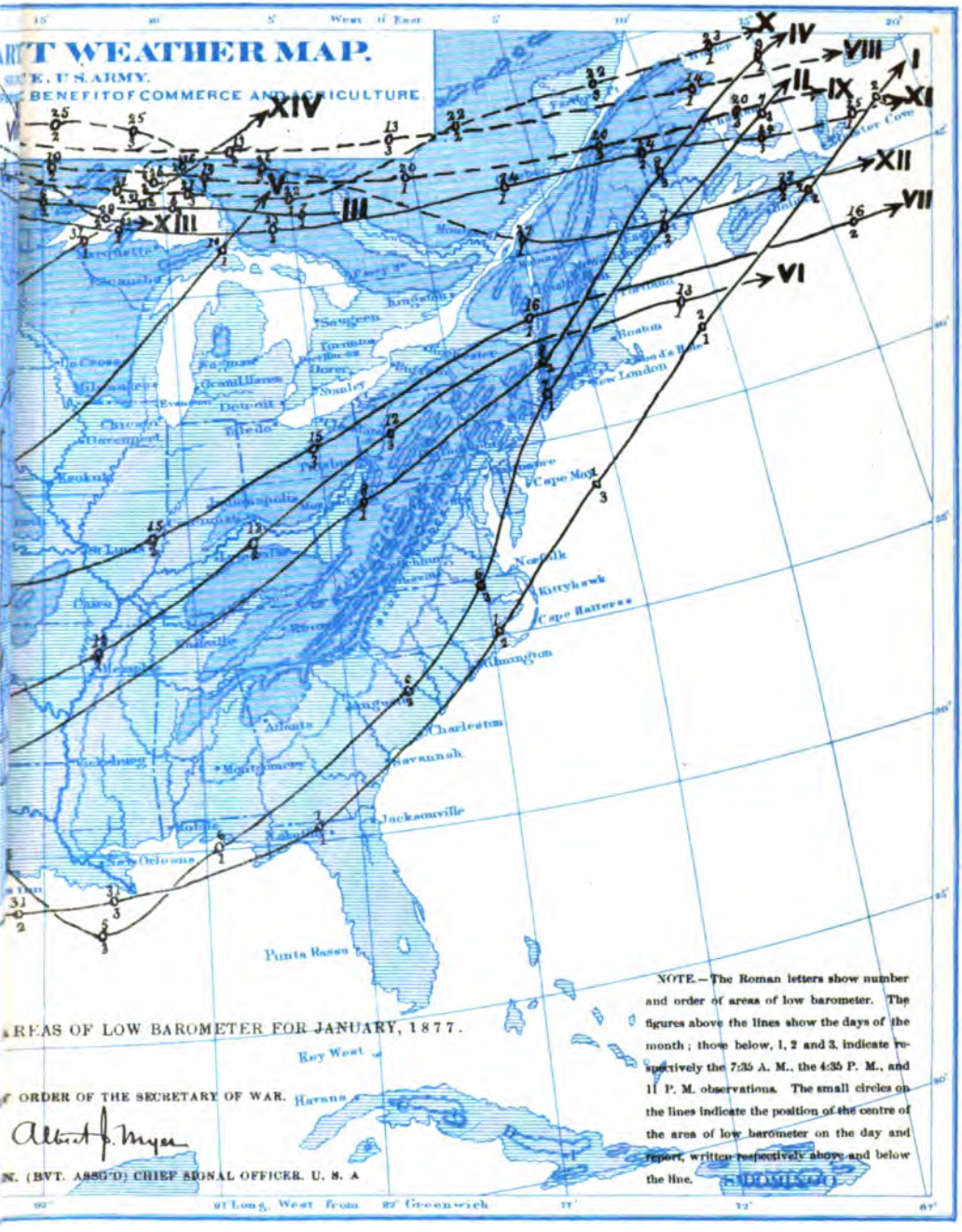
No. I.—It was observed the morning of the 1st in the northwest, with minimum temperatures from 25° to 29° below zero in the Red River of the North Valley. Snow fell in Central Dakota. By morning of the 2d the pressure had increased, with a barometric reading of 30.73 inches at Yankton. The area of 0° minimum temperature extended into the eastern portions of Nebraska and Kansas, Missouri, Illinois, Indiana, and Wisconsin. During the day it moved southward, and at 7.35 a. m. of the 3d was central in Northern Texas, producing a light "norther" on the coast. From Tennessee northeastward over the central portion of the Middle States, in the Saint Lawrence Valley, and Northern New England, the temperature fell below 0°. On the morning of the 4th it covered the Southern States, with diminished pressure, being central in Alabama. The minimum temperature continued below 0° from the Saint Lawrence Valley and New England to the central portion of the Middle States. By the following morning, in advance of low pressure No. II, it moved to the South and Middle Atlantic coasts, with continued cold weather in the Atlantic States. During the 5th and 6th it gradually disappeared northeastward along the coast.

No. II.—During the day and night of the 6th, in rear of low pressure No. III, it advanced southeastward over the Northwest. At Breckenridge, the temperature fell from 24° to —18° within twenty-four hours. High northwesterly winds were produced in Dakota and Minnesota, reaching 70 miles per hour at Pembina. The 7th, it rapidly extended south and eastward, with a decided fall in the temperatures. Morning of the 8th it was central in Indian Territory. Minimum temperatures from 20° to 32° below zero were reported from Dakota and Minnesota, and below zero from the Upper Lakes to Kansas and Missouri. A very severe "norther" was produced, reaching 44 miles at Indianola and 62 at Galveston, in connection with low pressure No. IV, and for which cautionary signals had been ordered the evening of the 7th. The temperature fell 38° in two hours at Melissa, Tex. At 7.35 a. m., 9th, it reached from Louisiana to Ohio and the Virginias; excepting a few stations along the Texas, South Atlantic, and Nova Scotia coasts, the temperatures had fallen below freezing, and below zero from Tennessee to Northern Dakota and the lakes, and in the northern portions of New York and New England. By morning of the 10th, with increased pressure, and in advance of low pressure No. V, it moved to Nova Scotia and New Brunswick, whence it passed to the eastward during the 10th.

No. III.—At midnight of the 10th it was first felt as progressing southward from Manitoba over Minnesota and Dakota, forcing low pressure No. VI to take a more southerly course. Morning of the 11th a minimum temperature of —34° was recorded at Fort Garry. The pressure continued increasing, reaching a maximum of 30.91 at Breckenridge by midnight. At 7.35 a. m., 12th, the highest reached from the southern


WAR DEPARTME
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VI
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I
San Francisco
San Diego
AVERAGE PROGRESS OF AREAS OF LOW BAROMETER.
No. Velocity.
I 40 miles per hour.
II 42 do.
III. 33 do.
IV. 44 do.
V. 37 do.
VI. 28 do.
VII. 34 do.
VIII. 38 do.
IX. 45 do.
X. 34 do.
XI. 35 do.
XII. 31 do.
XIII. 37 do.
XIV. 21 do.
TRACKS OF CENTRES OF
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No. I.



REAS OF LOW BAROMETER FOR JANUARY, 1877.

NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:35 A. M., the 4:35 P. M., and 11 P. M. observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.

ORDER OF THE SECRETARY OF WAR.

Albert J. Myer

N. (BVT. ASS'T) CHIEF SIGNAL OFFICER, U. S. A.

Long. West from Greenwich

portions of Dakota and Minnesota toward Colorado and Western Kansas. Minimum temperatures, —35° at Fort Garry, and below zero from Montana, Wyoming, Colorado, and Western Kansas to the lakes, in the Northern portions of New York and New England, the Saint Lawrence Valley and Nova Scotia. The temperature fell from 30° to —20° in ten hours, on the 12th, at Watertown, N. Y. During the evening a light "norther" commenced on the Texas coast, for which signals had been displayed the evening previous. The temperature fell from 70° to 21° within twenty-four hours at Denison, and at New Ulm, Texas, 31° from 10 a. m. to 2 p. m. Morning of the 13th it was central in Indian Territory, but was gradually dissipated during the day in advance of storms Nos. VII and VIII.

No. IV.—It appeared, night of the 13th, in Manitoba, and northern portions of Dakota and Minnesota, with a minimum temperature of —53° at Pembina. As storm No. VII passed eastward, it extended southward from Dakota on the 14th, with continued low temperatures in Minnesota and Dakota. Afternoon of the 15th it was central in Dakota, and signals were hoisted for a "norther" from Indianola to Mobile. At the former a velocity of 44 miles was recorded; at Galveston, 40; those from New Orleans and Mobile were reported as not justified. Morning of the 16th it was highest in Indian Territory, in the northern portion of which the temperature fell to zero. During the day its progress was northeastward, and the following morning, with increased pressure, it covered the Middle and Eastern States. Signals were ordered for the North Carolina coast, which were succeeded by high northerly winds. At 7.35 a. m., 18th, it continued over the Middle Atlantic States, after which it moved southward along the coast and disappeared.

No. V.—On the morning of the 17th it was first observed in Dakota, where it was central the following morning, with increased pressure and lower temperatures; maximum barometer 30.71 inches at Fort Sully and Yankton. During the 18th it moved southeastward, but, by 7.35 a. m., 19th, in advance of storm No. IX, it had lost its distinctive features.

No. VI.—During the afternoon, 19th, it appeared in Dakota, producing high northwesterly winds, and extended southward. At 7.35 a. m., 20th, it was central in Kansas. Signals were displayed for a light "norther" on the Texas coast, which was felt at Galveston morning of the 21st, when this high-pressure area covered the Ohio valley. During the 21st and 22d it passed to the eastward over the Middle States, New England, and Nova Scotia, in advance of low pressure No. X.

No. VII.—On the morning of the 22d it was central in Dakota and Nebraska; maximum barometer 30.71 inches at Yankton. A light "norther" was produced at night on the Texas coast. At 7.35 a. m., 23d, it extended from Kansas and Indian Territory toward the Ohio Valley. During the day it continued over the country west of the Lower Mississippi Valley, while storm No. XI was moving eastward, and on the following morning it reached from Dakota to Texas; maximum barometer, 30.78 inches, at Yankton. Morning of the 25th it was central in Tennessee; 26th, covered the Southern States; 27th, central in Louisiana; 28th, in the Lower Mississippi Valley; 29th, in the Gulf States; 30th, united with a high-pressure area which advanced southward from Canada toward the Lake region, and reached from the Eastern Gulf States to the Lower Lakes; 31st, covered the Middle Atlantic and South Atlantic States, and during the day moved to the South Atlantic coast in advance of low pressure No. XIV.

Areas of low pressure.—Of these, fourteen have been charted. The centers of the majority have passed eastward to the north of the Lake region, while some of them produced only fresh to brisk winds in that section. Those crossing the southern portions of the country, and generally during the first half of the month, were the most severe, especially along the Texas and Atlantic coasts.

No. I.—This storm was designated in the December review as No. XV. At 7.35 a. m. of the 1st very cold weather prevailed from the Rocky Mountains eastward, being below freezing, excepting portions of the Eastern Gulf and South Atlantic States. The heavy rains along the coast changed into heavy snow over the interior, the latter extending during the evening to the Lower Lakes and Southern New England, and was followed by colder, clearing weather in the Southern States. During the 2d, as it moved northeastward along the coast with increasing severity, it was preceded by heavy snow. The following are some of the greatest depths reported, viz: Jacksboro Tex., 12 inches; Point Pleasant, La., 15; Decatur, Ala., over 17; Hiawassee College, Tenn., 20; Murphy, N. C., 15; Lynchburg, 14; Washington, 13; Cape May, 8; New York City, 15; Philadelphia, 20; and Chepachet, R. I., 18 inches. Minimum barometer 28.76 inches at Sydney, Nova Scotia, 11 p. m., 2d. The maximum hourly wind velocities recorded are: Galveston N., 54 miles; Key West, W., 38; Cape Lookout, NE., 50; Capes Henry and May, NE., 52; Thatcher's Island, NW., 48; and Mount Washington, N., 100. Cautionary signals had been displayed, December 31, along the Texas coast, and were ordered on the first along the Atlantic coast from Georgia to Maine; stations in Nova Scotia, New Brunswick, Saint Lawrence Valley and Newfoundland were also warned of its approach.

No. II.—Its approach was indicated on the night of the 3d by diminishing pressure

in the Northwest. During the 4th light snows fell from the Lake region to Wyoming and Colorado, partly changing to sleet and rain. On Pike's Peak the wind velocity reached N., 42 miles; at Dodge City, N., 32. The 5th, it moved southward to the Gulf coast, producing frequent light rains in the Gulf States. The 6th, during its progress northeastward, rainy weather prevailed in the Eastern Gulf, South Atlantic, and Middle States, partly changing into sleet and snow over the interior, with increasing winds and diminishing pressure. Maximum velocities: At Cape Hatteras, SE., 36; Cape May, E., 44 miles. 7th, the pressure continued diminishing, minimum 28.85 at Boston, with heavy rains along the coast, heavy snow throughout the interior, and increasing winds. At Sandy Hook, SW., 46 miles; New London, W., 40; Thatcher's Island, E., 48; Eastport, E., 36; and Mount Washington, NW., 96. It disappeared to the northeastward at night. Signals were displayed along the coast from Georgia to Maine, and warnings sent to stations in Nova Scotia, New Brunswick, Saint Lawrence Valley, and Newfoundland.

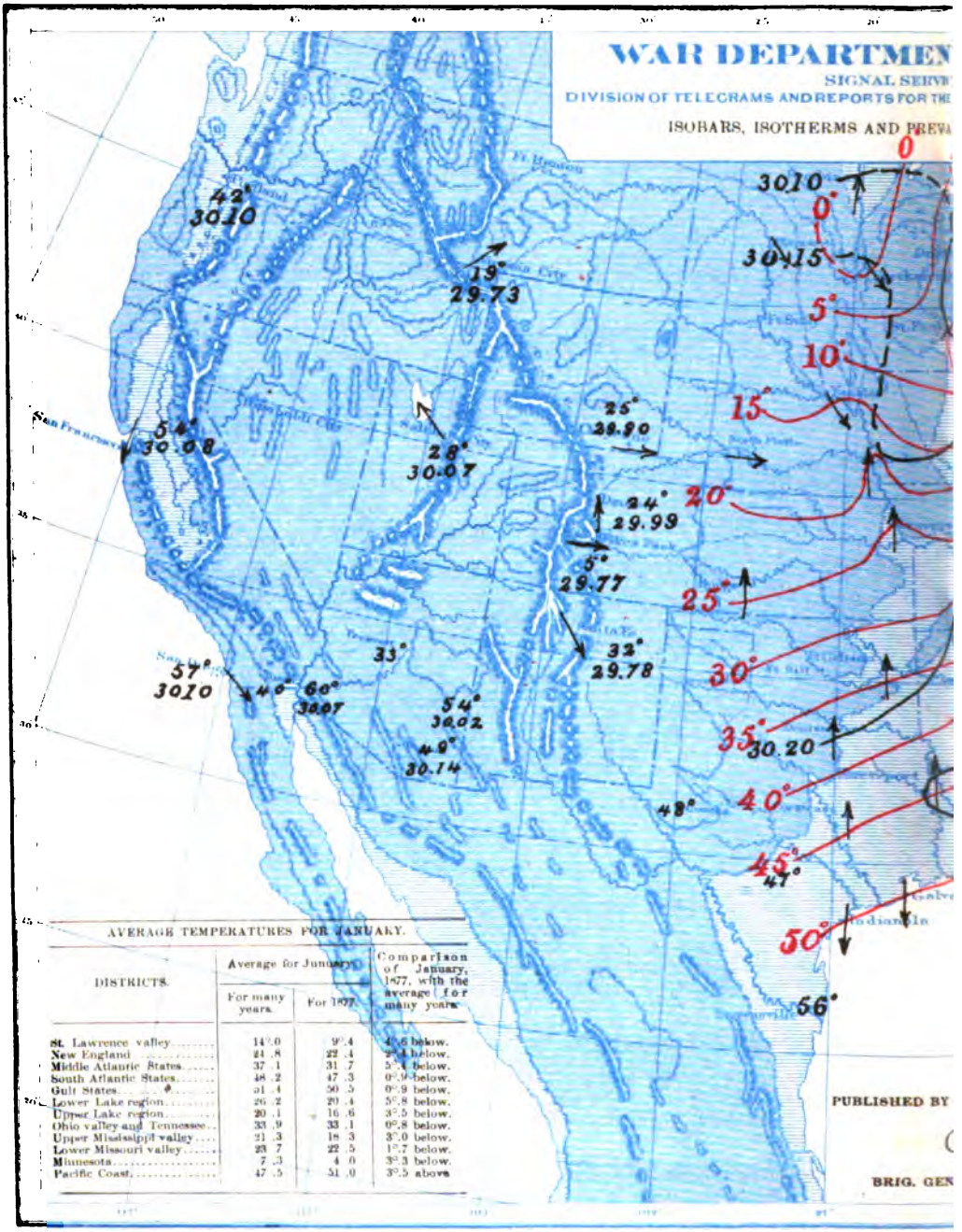
No. III.—During the 6th it was accompanied by light snows from Dakota to Michigan, and by increasing southerly winds, veering to brisk and high northwesterly, in the Northwest and Upper Lake region, reaching, at Pembina, NW., 70 miles; Milwaukee, NW., 32; Escanaba, S., 28. 7th, it disappeared, as shown on the chart, and probably united with storm No. II. Signals ordered for Milwaukee and Grand Haven were justified.

No. IV.—On the 6th and 7th this storm apparently developed from No. III, in advance of high pressure No. II, and produced occasional rains from the Gulf States to the Ohio Valley, turning into snow at night. 8th, generally cloudy weather, with frequent snow, prevailed from Tennessee northeastward to the Saint Lawrence Valley, New Brunswick, and Nova Scotia, changing to rain along the coast. It also increased in severity. Maximum velocities: Kittyhawk, N., 48 miles; Cape May, NW., 44; Sandy Hook, NW., 45; Newport, NW., 35; Thatcher's Island, NW., 36; Eastport, NW., 32. Signals were displayed along the Gulf and Atlantic coasts, all of which were justified by dangerous winds at or in the vicinity of the stations, excepting Mobile, Key West, Jacksonville, Savannah, and Charleston.

No. V.—Falling barometer and warmer southeasterly winds indicated the approach of this disturbance, on the afternoon of the 8th, in the Upper Missouri valley, and were succeeded by snow. On Pike's Peak a very severe storm prevailed, with a recorded velocity of NW. 80 miles. 9th, the snow-area extended to the Lakes, Indiana, Illinois, and Missouri. The temperature fell 24° in twenty-five minutes at Denver. At 11 p. m. it appeared as a barometric trough, reaching from Lake Superior to Indian Territory. During the 10th it disappeared over Canada. The signals displayed at Grand Haven and Milwaukee were justified.

No. VI.—This storm apparently passed southeastward over Montana on the 10th, producing light rains at Portland, Or., and light rain, turning into snow, at Virginia City. In the Northwest, frequent light snows fell, and high southerly winds were reported from Nebraska; S., 48 miles, at North Platte. Its southeastward course was due to the high pressure No. III, which was advancing southward over Manitoba the night of the 10th. At 4.35 p. m., 11th, it appeared as an extensive barometric trough, reaching from Northern Texas northeastward over Ohio to the month of the Saint Lawrence, in which rainy weather prevailed from Western Pennsylvania to Southern Missouri, but thence north and northeastward stormy and snowy weather. Maximum velocities: At Dodge City, NE., 44; Milwaukee, N., 28; Port Huron, N., 30; Oswego, SE., 30; and Cape May, S., 30. At midnight it appeared as two distinct depressions, central in Arkansas and near Chatham, N. B. The latter passed southeastward into the Atlantic. During the 12th, rainy weather accompanied the former from Tennessee and the Ohio Valley to Pennsylvania and New Jersey, and snow thence to the Lakes and New England. A thunder-storm was reported from Mississippi. 13th, it disappeared eastward over New England. Signals were displayed along the coast from North Carolina to Maine, at Milwaukee and Grand Haven, the majority of which were justified. Maximum velocities: Sandy Hook, W., 36; Newport, W., 27; Thatcher's Island, NW., 40.

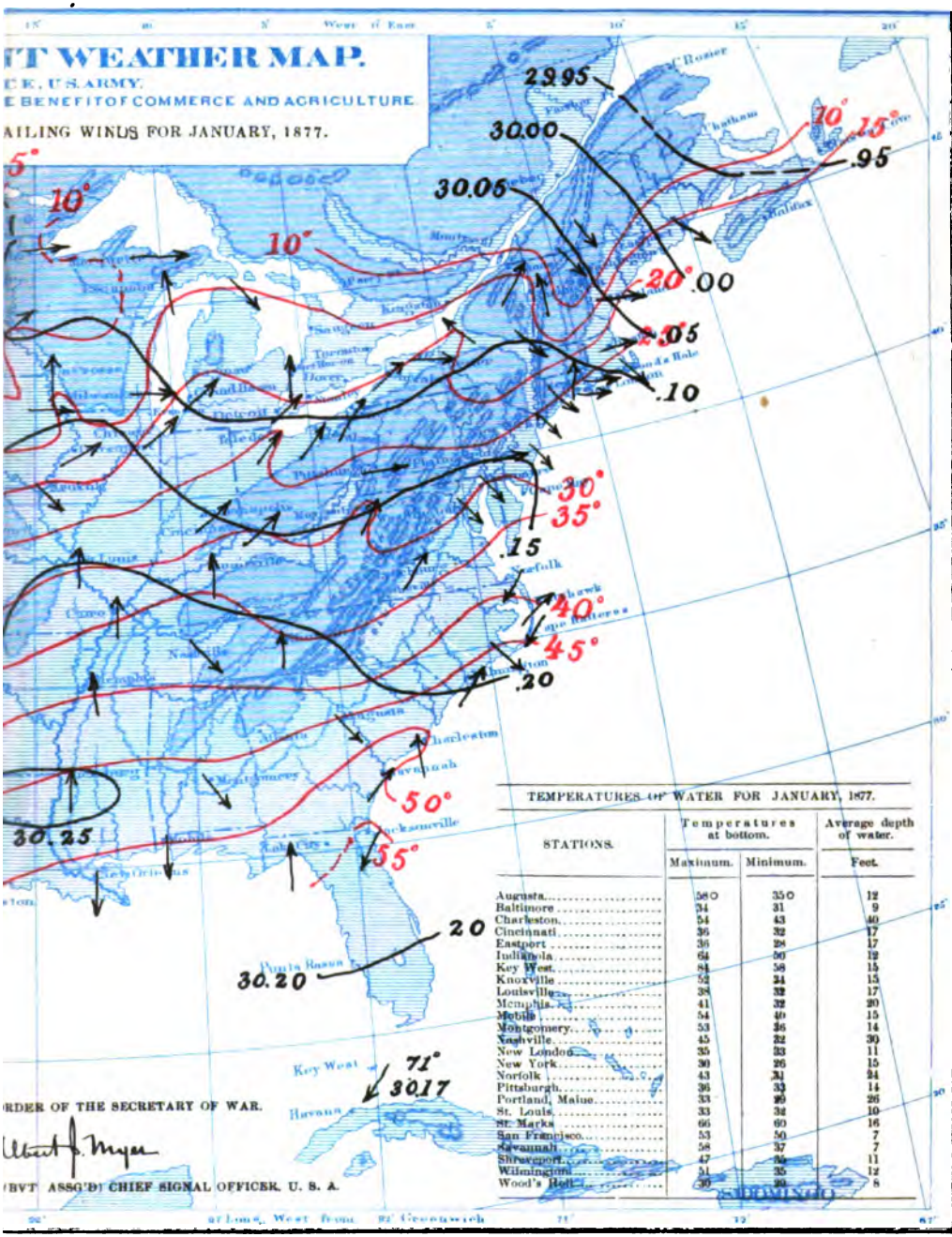
No. VII.—At San Francisco, high northerly winds, maximum 38 miles, prevailed during the 12th. Rainy weather commenced at San Diego, morning of the 13th, accompanied by high winds and hail, and extended into Arizona during the 13th and 14th. On the latter date, light snow fell in Utah, Dakota, and Minnesota, and the storm was apparently central, at 4.35 p. m., in southern Colorado, with a heavy snow-storm on Pike's Peak. There were indications of this storm advancing toward the Northwest, but it was forced to take a more southerly course by high-pressure area No. IV. During the 15th, very cold, stormy weather, with snow, prevailed from Colorado, Wyoming, and Dakota eastward over the Lake region to New England, and thence southward threatening and rainy weather, with increasing southerly winds. On the 16th, it passed eastward over New England and south of Nova Scotia, followed by clearing weather. Signals were displayed at Grand Haven, Milwaukee, along the Atlantic coast from Georgia to Maine, and warnings sent to all the Canadian stations.



AVERAGE TEMPERATURES FOR JANUARY.

DISTRICTS.	Average for January.		Comparison of January, 1877, with the average for many years.
	For many years.	For 1877.	
St. Lawrence valley	14°.0	9°.4	4°.6 below.
New England	24 .8	22 .4	2°.4 below.
Middle Atlantic States	37 .1	31 .7	5°.4 below.
South Atlantic States	48 .2	47 .3	0°.9 below.
Gulf States	51 .4	50 .5	0°.9 below.
Lower Lake region	26 .2	20 .4	5°.8 below.
Upper Lake region	20 .1	16 .6	3°.5 below.
Ohio valley and Tennessee	33 .9	33 .1	0°.8 below.
Upper Mississippi valley	21 .3	18 .3	3°.0 below.
Lower Missouri valley	23 .7	22 .5	1°.2 below.
Minnesota	7 .3	4 .0	3°.3 below.
Pacific Coast	47 .5	51 .0	3°.5 above

No. II.



TEMPERATURES OF WATER FOR JANUARY, 1877.

STATIONS.	Temperatures at bottom.		Average depth of water.
	Maximum.	Minimum.	Feet.
Augusta	58	35	12
Baltimore	34	31	9
Charleston	54	43	40
Cincinnati	36	32	17
Eastport	36	28	17
Indianola	64	60	12
Key West	84	58	15
Knoxville	52	24	15
Louisville	38	32	17
Memphis	41	32	20
Mobile	54	40	15
Montgomery	53	36	14
Nashville	45	32	30
New London	35	33	11
New York	30	26	15
Norfolk	43	31	24
Pittsburgh	36	33	14
Portland, Maine	33	29	26
St. Louis	33	32	10
St. Marks	66	60	16
San Francisco	53	50	7
Savannah	58	37	7
Shreveport	47	26	11
Wilmington	51	35	12
Wood's Holl	30	29	8

Maximum velocities: Escanaba, N., 36; Milwaukee, NE., 32; Capes Lookout and Hatteras, SW., 36; Thatcher's Island, N., 32, and Eastport, NE., 42.

No. VIII.—During the night of the 12th it advanced southeastward over Manitoba towards the Upper Lakes. The 13th, brisk and high southerly winds, veering to westerly, with occasional snow, accompanied it in Minnesota and the Lake region. During the 14th it passed eastward over the Gulf of Saint Lawrence, producing brisk and high southwesterly winds, veering to northwesterly, and snow from the Saint Lawrence Valley to Nova Scotia. Signals were displayed at Milwaukee and Grand Haven, and continued along the Middle Atlantic and New England coasts. Maximum velocities recorded: Grand Haven, SW., 42; Rochester, W., 36; Father Point, W., 34; Eastport, NW., 36.

No. IX.—On the morning of the 19th this disturbance was felt in Manitoba, Dakota, and Minnesota by a decided fall in the barometer. As it progressed southeastward it increased in severity, with brisk and high southerly winds, veering to westerly, and rain, partly changing into snow, in the Lake region. Rainy weather also prevailed in the southwest and extended to the Ohio valley, Tennessee, and the Middle States. The 20th the central depression continued diminishing, with minimum barometric readings of 28.93 inches at Quebec and Father Point. It continued increasing in severity from the Middle States and Lower Lake region northeastward, and disappeared at night. Maximum velocities: Escanaba, SW., 33; Grand Haven, W., 40; Buffalo, SW., 50: Montreal and Quebec, W., 40; Boston, W., 42; New York, W., 36; Cape Lookout, SW., 36; and Mount Washington, NW., 102. Signals were displayed at Milwaukee, Grand Haven, along the coast from North Carolina to Maine, and all Canadian stations notified.

No. X.—In Minnesota, the Lake region, Saint Lawrence valley, New Brunswick, and Nova Scotia light snows occasionally fell during its progress eastward, and fresh to brisk winds prevailed. The only high wind reported was from Grand Haven, W., 35 miles, and for which signals were not ordered. A slight depression (not charted) appeared on the Gulf coast on the 21st, producing heavy rains, and at Galveston a very brisk wind, N., 28 miles. Thunder-storms were occasionally reported from Texas, Louisiana, Florida, Georgia, and South Carolina. During the 22d it apparently passed off the South Atlantic coast, with rainy weather in the South Atlantic States, and brisk to high northeasterly winds along the North Carolina coast. Maximum velocity, NE., 36 miles at Cape Henry. Thunder-storms continued in Louisiana and Georgia.

No. XI.—During the 23d this storm produced only light snows in Minnesota and the Lake region, and brisk to high southerly winds, veering to northwesterly, from the Missouri valley to the Upper Lakes. 24th, as the storm passed eastward the central depression continued diminishing, and it increased in severity. Minimum barometer, 29.17 inches at Sydney, morning of the 25th. Maximum velocities, Grand Haven, SW., 44; Oswego, NW., 34; Eastport, NW., 36; Mount Washington, NW, 120; Thatcher's Island and Wood's Holl, NW., 40; Sandy Hook, NW., 48; Cape May, NW., 54; Cape Henry, W., 40. Signals were displayed at Cape May, Sandy Hook, and from Boston to Eastport, and should have been ordered for all the stations from North Carolina to Maine.

No. XII.—On the 25th it appeared as a slight depression to the north of the Upper Lakes. The 26th it either disappeared into Canada or united with a second, which was central over Lake Superior during the afternoon. Brisk and occasionally high southerly to westerly winds, with clear weather, were produced in the Lake region. The 27th it crossed New England, accompanied by snow from the northern portion to the Saint Lawrence Valley, New Brunswick, and Nova Scotia, and succeeded by brisk and high southwest winds veering to northerly. Maximum velocities: Grand Haven, SW., 29; Erie, SW., 30; Buffalo and Sandy Hook, SW., 28; Boston, W., 28. Signals were ordered for Grand Haven, Milwaukee, the New Jersey and New England coasts. The majority of those at the coast stations were not justified. On the 28th, as the pressure increased, the winds shifted to northerly along the North Carolina coast, and increased at Kittyhawk to N., 34 miles, for which signals had been ordered.

No. XIII.—This depression was of slight interest, and apparently dissipated in the Upper Lake region.

No. XIV.—On the 28th, rainy weather prevailed along the California coast, with high southerly winds at San Diego and a thunder-storm in San Barnardino County. 29th, light rain fell at Santa Fé and light snow at Salt Lake City. At 7.35 a. m., 30th, it was central in Eastern Nebraska. During the day, as it progressed northeastward, rainy weather accompanied it from Indian Territory to Minnesota, Wisconsin, and Lake Michigan. The 31st, light rains fell from the Ohio valley to the Lakes. Signals displayed at Milwaukee and Grand Haven were justified; maximum velocity at latter, S., 30 miles.

Vessels experiencing storms.—3d, Province of Guipuscoa, Spain, hurricane. 4th, latitude 40° 43′ N., longitude 62° 07′ W., heavy WNW. gale; off Bermuda, heavy SE. gale lasting 15 hours, then to SW. for 24 hours; hurricane at Santander, Spain. 5th, 32° 20′ N., 72° 20′ W., WNW. gale for 12 hours; 41° N., 48° W., heavy gale. 6th, 46° 09′

N., 42° 03′ W., hard N. gale with heavy squalls; 44° 03′ N., 51° 31′ W., very strong WNW. gale; 44° N., 35° W., severe gale; 44° N., 31° W., hurricane. 7th, 26° 40′ N., 25° 49′ W., strong SE. to WNW. gale; 400 miles NW. of the Azores, ship Dakota destroyed by lightning. 9th, at Gibraltar, hurricane. 12th, Gulf of Lyons, France, furious gale. 13th, 46° 30′ N., 41° W., heavy W. gale; 48° 08′ N., 25° 40′ W., to 46° 50′ N., 32° 55′ W., heavy WSW. to NNW. gale, with squalls of hurricane force, lasting until 17th. 14th, near 36° 36′ N., 38° 09′ W., hurricane. 16th, 47° 47′ N., 35° 05′ W., heavy W. and N. gale, with very high sea; 45° 56′ N., 31° 35′ W., heavy W. gale and heavy sea; 45° 50′ N., 34° 44′ W., heavy WNW. to SW. storm, with furious squalls and tremendous sea. 17th and 18th, 49° 08′ N., 22° 02′ W., to 49° 50′ N., 26° 31′ W., strong W. gale and high sea. 24th, 45° 40′ N., 45° 30′ W., heavy NW. gale. 25th, longitude 66° W., from Havre to New York, violent NW. gale. 26th, 41° 40′ N., 60° W., heavy NW. gale and high sea with snow.

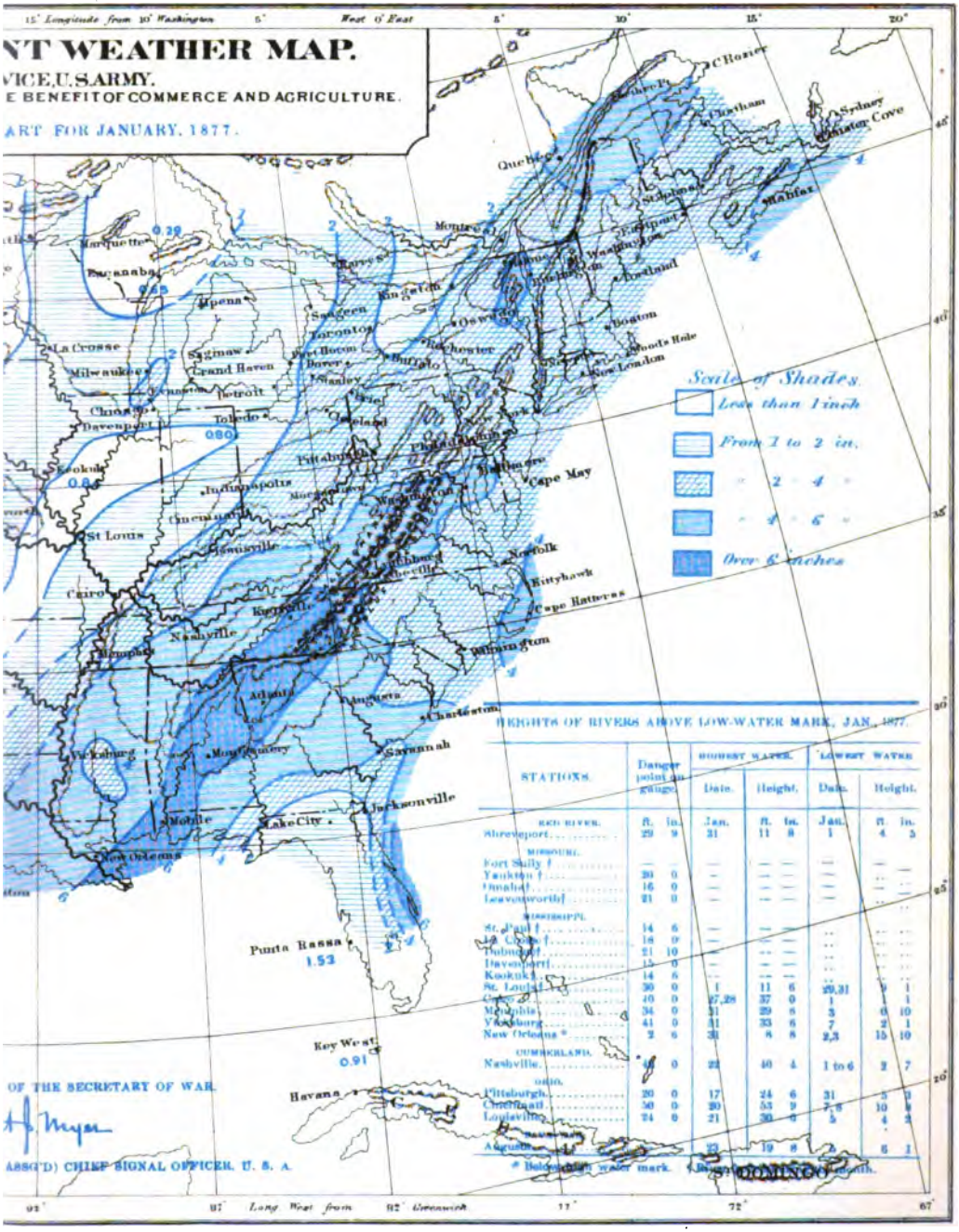
TEMPERATURE OF THE AIR.

The isothermal curves and figures upon Chart No. II illustrate the general distribution of the temperature of the air for the present month. A reference to the table in the lower left-hand corner of the same chart will show that the average is above that for years along the Pacific coast; it is below for all the other districts, especially the Lower Lake region, Middle Atlantic States, and Saint Lawrence Valley. This low average temperature is due to the fact that, while the weather was extremely cold at the beginning of the month, the high-pressure areas, as they passed eastward, covered the entire country, and the low-pressure areas moved well to the southward. The latter part of the month the pressure continued high in the Southern States, and the low-pressure areas crossed the northern portion of the country, especially the Lake region, producing warm, southerly winds and the mild weather which was generally experienced. At Cloverdale, Cal., the freeze on the 13th only injured the tops of the most delicate plants. During the first days of the month a large number of fish were frozen to death at Milton, Fla.

Maximum and minimum temperatures, respectively, for the month, are given, viz: In Maine, Orono, 40°, —32°, Cornish, 46°, —11°; New Hampshire, Mount Washington, 28°, —36°, Contoocookville, 47°, —23°; Vermont, Woodstock, 46°, —27°, Burlington, 43°, —16°; Massachusetts, Billerica, 44°, —15°, Boston, 50°, 2°; Rhode Island, Chepachet, 48°, 4°, Newport, 44°, 7°; Connecticut, Colebrook, 46,° —6°, New Haven, 48°, 4°; New York, Malone, 48°, —25°, Hudson, 56°, —5°; New Jersey, Salem, 54°, —4°, Atco, 55°, 3°; Pennsylvania, Tioga, 46°, —20°, Brownsville, 57°, 2°; Delaware, Milford, 60°, —4°, Dover, 58°, 0°; Maryland, Woodstock, 53°, —10°, Fort McHenry, 65°, —3°; District of Columbia, Washington, 61°, —3°; Virginia, Snowville, 63°. —8°, Norfolk, 73°, 16°; West Virginia, Salem, 60°, —8°, Weston, 60°, —2°; Ohio, Westerville, 50°. —24°, Kenton, 65°, —21°; Indiana, Laconia, 66°, —21°, Spiceland, 56°, —22°; Illinois, Riley, 44°, —21°, Anna, 72°, 0°; Michigan, Alpena, 49°, —14°, Lansing, 50°, —6°; Wisconsin, Neillsville, 44°, —27°, Embarrass, 51°, —17°; Minnesota, Fort Ripley, 44°, —41°, Duluth, 51°, —27°; Iowa, Independence, 49°, —28°, Keokuk, 58°, —9°; Missouri, Corning, 63°, —18°, Wet Glaze, 67°, —11°; Nebraska, De Sota, 56°, —22°; Omaha, 59°, —16°; Kansas, Council Grove, 60°, —14°, Sedgwick, 64°, —4°; Kentucky, Nicholasville, 62°, —12°, Louisville, 66°,—9°; Tennessee, Austin, 64°,—20°, Memphis, 68°, 6°; Arkansas, Mount Ida, 68°, 1°, Monticello, 71°, 10°; North Carolina, Murphey, 62°, —16°, Weldon, 75°, 6°; South Carolina, Spartanburg, 64°, 0°, Aiken, 75°, 17°; Georgia, Atlanta, 72°, 4°, Saint Mary's, 84°, 26°; Florida, Milton, 75°, 20°, Key West, 90°, 50°; Alabama, Carlowville, 74°, 13°, Montgomery, 74°, 16°; Mississippi, Vicksburg, 73°, 16°, Brookhaven, 76°, 26°; Louisiana, Baton Rouge, 78°, 18°, Lake Charles, 78°, 23°; Texas, Mesquite, 73°, 8°, Fort McKavett, 80°, 14°; Indian Territory, Fort Gibson, 70°, 0°, Fort Sill, 64°, 14°; New Mexico, Fort Union, 67°, 0°, Santa Fé, 53°, 6°; Colorado, Fort Lyon, 45°, —19°, South Pueblo, 62°, —9°; Wyoming Territory, Fort Sanders, 43°, —22°, Cheyenne, 50°, —14°; Dakota Territory, Pembina, 40°,—53°, Yankton, 51°, —19°; Utah, Coalville, 50°,—30°, Salt Lake City, 50°, 3°; Nevada, Camp McDermit, 48°, 0°, Carson City, 65°, 1°; California, Salinas City, 77°, 21°, El Monte, 86°, 34°; Oregon, Portland, 58°, 27°.

Ice.—At Decatur, Ala., Tennessee River frozen over 2d to 4th, ice 2 inches thick, navigation suspended three days. Albemarle, N. C., on Pedee River, in eddies, 4 inches thick, 15th; Lenoir, ponds and streams were frozen 3 to 8 inches. Snowville, Va., 18 inches thick (unheard of before). Salem, N. J., creek remains firm 31st; has been 15 to 18 inches thick. Philadelphia, Pa., on the Schuylkill, reported 32 inches thick 25th. Wappinger's Falls, N. Y., pond ice reported 30 inches thick 6th, and 36 inches 31st; Malone, pond ice 30 inches thick 13th. Morgantown, W. Va., 8 to 15 inches thick 13th. Wooster, Ohio, 24 inches thick. Afton, Iowa, pond ice 14 inches thick 25th; Keokuk, river ice 20 to 30 inches 13th; Independence, river ice 21 inches. Leavenworth, Kans., 15 inches thick 8th. Omaha, Nebr., 24 inches thick 31st; Plattsmouth, 24 to 30 inches

No. III.


NT WEATHER MAP.
VICE, U.S. ARMY.
E BENEFIT OF COMMERCE AND AGRICULTURE.
ART FOR JANUARY, 1877.
Scale of Shades.
Less than 1 inch
From 1 to 2 in.
" 2 " 4 "
" 4 " 6 "
Over 6 inches
HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, JAN., 1877.
STATIONS.
Danger point in gauge.
HIGHEST WATER.
LOWEST WATER.
Date.
Height.
Date.
Height.
RED RIVER.
Shreveport
MISSOURI.
Fort Sully †
Yankton †
Omaha †
Leavenworth †
MISSISSIPPI.
St. Paul †
La Crosse †
Dubuque †
Davenport †
Keokuk †
St. Louis †
Cairo
Memphis
Vicksburg
New Orleans *
CUMBERLAND.
Nashville
OHIO.
Pittsburgh
Cincinnati
Louisville
Augusta
* Below high water mark.
† Below low water mark.
Quebec
Montreal
Portland
Boston
Rhode Island
New London
Cape May
Norfolk
Kittyhawk
Cape Hatteras
Wilmington
Charleston
Savannah
Jacksonville
Lake City
Mobile
Montgomery
Atlanta
Augusta
Nashville
Louisville
Cincinnati
Indianapolis
Columbus
Toledo
Detroit
Cleveland
Buffalo
Rochester
Oswego
Albany
Utica
Syracuse
Binghamton
Elmira
Corning
Rochester
Toronto
Kingston
Ogdensburg
Sarnia
Port Huron
Saginaw
Grand Haven
Milwaukee
La Crosse
Marquette
Escanaba
Upena
Sargeen
Davenport
Rock Island
Keokuk
St Louis
Cairo
Memphis
Vicksburg
Punta Rassa
1.53
Key West
0.91
Havana
OF THE SECRETARY OF WAR.
ASSC'D) CHIEF SIGNAL OFFICER, U. S. A.
Long. West from Greenwich
15° Longitude from 10° Washington
West of East

thick 13th. La Crosse, Wis., river ice 13 inches thick 31st. Breckenridge, Minn., on Red River of the North, 40 inches thick, and on the Boise des Sioux, 43 inches 31st.

Frost in the ground.—It has been reported as frozen to a depth of 5 inches at Brookhaven, Miss., on the 1st; Alta Vista, Va., 7 inches, 6th; Danville, Ky., 1 foot, 9th; College Hill (near Cincinnati), Ohio, 3½ feet, 13; Freehold, N. J., 14 inches, 29th; Breckenridge, 6 feet 4 inches, 30th; Dover, Del., 30 inches at close of month; Tabor, Iowa, 4 feet; Independence, Iowa, 18 inches; Creswell, Kans., 1 foot; Sedgwick, Kans., 10 inches; Fallston, Md., 7 inches; Somerset, Mass., 14 inches; Wooster, Ohio, 1 foot; North Lewisburg, Ohio, 16 inches. Owing to the heavy covering of snow the frost had penetrated the ground only to a depth of 8 inches at Ardenia, N. Y.; at Westborough, Mass., the ground under the snow was reported free of frost.

PRECIPITATION.

Upon the Chart No. III is represented the amount of rain-fall and melted snow. At Jacksboro, in Northern Texas, several sprinkles were reported, but not sufficient to measure; same from Fort McKavett, northwest of San Antonio, Tex. Stations reporting less than one-tenth of an inch: Wickinburg, Ariz., 0.01; Maricopa, Ariz., 0.08; Yuma, Cal., 0.09; Fort Larned, Kans., 0.08; Breckenridge, 0.03; Pembina, 0.06.

Total snow-fall during the month: For Northern New England it varies from 14 to 31 inches; Southern New England, 9 to 24; New York, 11 to 48; Middle Atlantic States, 1 to 26; Lower Lake region, 9 to 35; Upper Lake region, 4 to 37; Ohio Valley, 4 to 21; Tennessee, 5 to 17; North Carolina, 1.5 to 22; Mississippi and Louisiana, 2 to 15; Arkansas, 1 to 4; Upper Mississippi Valley, 4 to 17; Lower Missouri Valley, 4 to 21. Depth of snow at close of month, Northern New England, 24 to 44 inches; Southern New England, 4 to 20; Middle States, 0 in southern portion to 32 in Northern New York; Lower Lake region, 0 in western portion to 32 in eastern portion; Lower Ohio Valley, none; the Northwest, none in southern portions, 4 in Southern Minnesota and Southeastern Dakota.

Cloudy days.—The number of days on which the cloudiness has averaged eight-tenths or more, as reported by the voluntary observers, ranges for New England from 5 to 13; Middle States, 5 to 17; South Atlantic States, 4 to 13; Gulf States, 5 to 17; Ohio Valley to the Upper Lake region, 5 to 20; the Northwest, 2 to 15.

The number of days on which rain or snow has fallen, ranges as follows for the Signal-Service stations: New England, 7 to 18; Middle Atlantic States, 10 to 16; South Atlantic States, 6 to 16; Eastern Gulf States, 9 to 16; Western Gulf States, 8 to 18; Ohio Valley and Tennessee, 12 to 17; Lower Lake region, 14 to 23; Upper Lake region, 4 to 23; Northwest, 4 to 12; Rocky Mountain stations, 5 to 14; California coast, 6 to 9. Along the lakes the precipitation in the form of snow has frequently been very light, and at times not sufficient to measure. During severe snow-storms it is a difficult task to measure the precipitation, therefore chart No. III is only an approximation for the northern sections of the country.

Droughts.—Scarcity of water at Keokuk on the 4th. Dumbarton and Contoocookville, N. H., water very scarce, some farmers being compelled to melt snow to get water for stock. Pennville, Pa., during the first half of month streams very low. West Charlotte, Vt., drought continued all the month; no rain until February 1st. North Argyle, N. Y., drought not allayed 18th.

RELATIVE HUMIDITY.

The average relative humidity for the month, as reported from the Signal-Service stations, ranges as follows: In New England, 69 to 79 per cent.; Middle Atlantic States, 73 to 84; South Atlantic States, 72 to 83; Gulf States, 70 to 80; Indian Territory, Arkansas, Tennessee, and the Ohio Valley, 67 to 76; Lower Lake region, 72 to 80; Upper Lake region, 67 to 82; Northwest, 66 to 79; plains of Kansas and Nebraska, 74 to 81; Rocky Mountain stations, 47 to 75; San Diego and San Francisco, 66; Portland, Oreg. 74; Mount Washington, 87.

WINDS.

Prevailing winds.—These are shown upon Chart No. II, the arrows flying with the wind. At Fort Sully they have blown most frequently from the northwest; Portland, Oreg., south. The maximum hourly velocities have been given in the description of the movements of high and low-pressure areas.

Total movements of the air.—The following are the largest total movements, as recorded at the Signal-Service stations: Pike's Peak, 19,663 miles; Thatcher's Island, 12,084; Sandy Hook, 11,372; Cape May, 11,213; Cape Lookout, 10,960; Kittyhawk, 10,720; Grand Haven, 10,096; Cheyenne, 10,052. The smallest movements have occurred at the following stations: Nashville, 1,889 miles; Lynchburg, 2,031; Augusta, 2,153; Shreveport, 2,741; San Diego, 2,816; Baltimore, 2,903; Knoxville, 2,929. On Mount Washington it has been impossible to obtain a continuous record.

VERIFICATIONS.

Indications.—As worked up three times daily, and issued to the public, they have been carefully compared with the actual conditions during the succeeding twenty-four hours, and the following result obtained, viz: The percentage verified averages 91.8 for New England; 89.0, Middle States; 85.4, South Atlantic States; 84.8, Eastern Gulf States; 85.5, Western Gulf States; 88.0, Ohio Valley and Tennessee; 90.5, Lower Lake region; 88.1, Upper Lake region; 89.0, Upper Mississippi Valley; 89.0, Lower Missouri Valley. For the whole country the average verified is 88.2 per cent. There were 7 omissions to predict out of 3,721, or 0.18 per cent.

Cautionary signals.—Grand Haven and Milwaukee are the only stations along the lakes at which signals were displayed, owing to the suspension of navigation. Out of 229 ordered to be displayed along Lake Michigan, the Atlantic and Gulf coasts, 172 were justified, 13 were lowered too soon, 1 was ordered late, and 57 were reported not justified. From scattered stations 27 cases were reported, in which the hourly wind velocity reached 25 miles and over, without the display of signals, except on the 24th from the Middle Atlantic and New England coasts, when high westerly winds prevailed at nearly all of them, while signals had been ordered for the exposed stations alone.

NAVIGATION.

Height of rivers.—Upon Chart No. III is a table giving the highest and lowest water-marks, with the dates upon which they occurred. The Red River rose slowly but steadily, at Shreveport, from 4 feet 5 inches, 1st, to 11 feet 8 inches, 31st. In the Arkansas, at Little Rock, the fluctuations were very slight, and the water continued low; it was frozen over the 8th. The Missouri and Upper Mississippi continued frozen over and low the entire month. Lower Mississippi: Navigation suspended between Memphis and Cairo till the 14th, when the ice-gorges passed off. Below Cairo the rise continued to the close of the month, due to the water from the Ohio, Cumberland, and Tennessee Rivers. From Cairo to Saint Louis the ice-blockade continued at the end of the month. Cumberland: The ice-gorges below Nashville moved down on the 10th and 11th, after which navigation was resumed. Tennessee: At Paducah the ice-gorge moved out into the Ohio the 15th. Allegheny: Closed during the month. Monongahela: Ice-gorges passed off on the 13th and 14th with great destruction. Ohio: At Cairo the river was clear on the 12th. The ice-gorges moved some on the 9th at Ironton, Ohio; 12th and 13th, at Cincinnati. On the 14th there was a general movement of the ice from Pittsburgh to Paducah, which commenced passing Cairo the 15th, after which the resumption of navigation took place. The loss of property above Louisville was very heavy in the shape of steamers, barges, coal, &c. Potomac: At Georgetown, D. C., the ice-gorge gave way the 18th, damaging vessels and property along the banks. Hudson: At Garrison's, opposite West Point, has remained open, but above and below teams cross on the ice.

TEMPERATURE OF WATER.

As heretofore, the maximum and minimum temperatures alone, with the average depth of the water, are given in the table on Chart No. II.

ATMOSPHERIC ELECTRICITY.

Thunder-storms.—1st, Daytona, Fla., Saint Mary's, Ga.; 7th, Howard, Nebr.; 8th and 12th, Fayette, Miss.; 14th, Santa Fé, Sedgewick, Kans.; 15th, Saint Louis, Anna, Ill., Brookhaven, Miss., Weldon, N. C., Jackson, Tenn.; 17th, Mobile, Fayette, Miss., 18th, Montgomery; 20th, Galveston; 21st, Charleston, Galveston, Tybee Island, Ga., New Orleans; 22d, Tybee Island, New Orleans, Fayette, Miss.; 23d, Aiken, S. C.; 25th, Melissa, Tex.; 28th, San Bernardino, Cal.; 30th, Stanley, Kans., Starkey, N. Y., Oregon, Mo.

Distant lightning.—13th, Fayette, Miss.; 17th, Montgomery; 19th, Jackson, Tenn.; 20th, Atlanta, Ga.; 21st, Savannah; 27th, Portsmouth, N. C.

Aurcras.—6th, Cornish, West Waterville, Surry, Gardiner, Standish, and Orono, Me., Saint Paul, Duluth, Breckenridge, and Minneapolis, Minn., Malone, N. Y., Fort Pembina and Bismarck, Dak., West Charlotte, Vt.; 7th, Gardiner, Me., Minneapolis, Saint Paul, and Duluth, Minn., Escanaba, St. John's, N. F.; 8th, Escanaba; 13th, Wappinger's Falls, N. Y.; 14th, Gardiner, Me., Waltham, Mass., North Argyle, N. Y., Fort Pembina, Dak.; 15th, Duluth, Fort Pembina, Dak.; 16th, Fort Brady, Mich.; 19th, Denver; 20th, Hillsboro, Ohio.

Electric ground currents.—The observer at Barnegat, N. J., reports strong electric currents on the 17th; the telegraph line was working at 6 p. m., although grounded north and south.

OPTICAL PHENOMENA.

Solar halos.—1st, Iowa, Minnesota, New Hampshire, New York, Pennsylvania; 2d, Iowa, New York, Pennsylvania; 3d, Illinois, New York; 4th, Maine, Nebraska, Vermont; 5th, Dakota, Illinois, Indiana, Michigan, Minnesota, Nebraska, New York, Ohio; 6th, California, Illinois, Massachusetts, Michigan, New York, Ohio, Vermont; 7th, Iowa, Louisiana, Minnesota, Mississippi, Nebraska; 8th, Dakota, Illinois, Massachusetts, Minnesota, New Hampshire, Rhode Island; 9th, Connecticut, Indiana, Michigan, Minnesota, Nebraska, Ohio, Pennsylvania; 10th, Massachusetts, Minnesota, Rhode Island, Tennessee; 11th, Iowa, Maine, Massachusetts, Nebraska, New Hampshire, New Jersey, New York, Pennsylvania; 12th, Maine, Nebraska, New Jersey, New York, Vermont; 13th, New Hampshire, Vermont; 14th, Dakota, Illinois; 15th, Colorado, Dakota, Georgia, Iowa, Nebraska, South Carolina; 16th, Dakota, Georgia, Illinois, Michigan, South Carolina; 17th, Maine, Minnesota, Nebraska, New Hampshire, New York, Rhode Island; 18th, Minnesota, Nebraska; 19th, Colorado, Dakota, New York, Virginia; 20th, Dakota, Georgia, Iowa, Minnesota, Nebraska; 21st, Iowa, Kansas, Minnesota, Nebraska, New York, Ohio, South Carolina; 22d, Colorado, Indiana, Ohio; 23d, Canada. Iowa, Minnesota, Pennsylvania; 24th, Iowa, New York; 25th, New Jersey, North Carolina, Ohio, South Carolina, Vermont; 26th, Maine, New Hampshire, Vermont; 27th, Illinois, Texas; 28th, Illinois, Maine, New Hampshire, New York, Tennessee, Vermont; 29th, Illinois, Michigan, Minnesota, New York, Tennessee; 30th, Illinois, Indiana, Michigan, Ohio; 31st, Alabama, Maine, Minnesota, Mississippi, New Hampshire, New York, Tennessee.

Lunar halos.—1st, Dakota, Iowa, Pennsylvania, Tennessee, Virginia; 2d, Illinois, Iowa, Minnesota, New York, North Carolina, Tennessee, Wisconsin; 3d, Dakota, Iowa, Ohio, Tennessee; 4th, Vermont; 5th, Indiana, Missouri, Nebraska, New Jersey, Ohio, Texas; 6th, California, Massachusetts, New Hampshire, New Jersey, New York, Ohio; 7th, Nebraska; 8th, Delaware; 18th, Dakota, Massachusetts, Minnesota, New Mexico; 19th, Connecticut, Dakota, Kansas, Massachusetts, Minnesota, Michigan, North Carolina, Rhode Island; 20th, Arkansas, Connecticut, Georgia, Kentucky, Massachusetts, Minnesota, Missouri, New Jersey, North Carolina, Ohio, Tennessee; 21st, Connecticut, Florida, Indiana, Iowa, Maine, Massachusetts, Michigan, Minnesota, Nebraska, New Hampshire, New York, Ohio, Pennsylvania, Rhode Island; 22d, Dakota, Indiana, Maine, Massachusetts, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Tennessee, Vermont; 23d, California, Canada, Illinois, Iowa, Maine, Missouri, New Jersey, New Mexico. New York, Virginia; 24th, California, Canada, Iowa, Kansas, Minnesota, Missouri, Nebraska, New Mexico, North Carolina; 25th, California, Connecticut, Georgia, Iowa, Kansas, Massachusetts, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Rhode Island, South Carolina, Tennessee, Vermont; 26th, California, Indiana, Iowa, Maine, Massachusetts, Michigan, Mississippi, Missouri, New Jersey, New Mexico, New York, Tennessee, Wisconsin; 27th, Alabama, California, Iowa, Massachusetts, Michigan, Minnesota, Missouri, New Jersey, North Carolina, Oregon. Rhode Island, Texas; 28th, Alabama, Iowa, Kansas, Maine, Massachusetts, Missouri, Montana, New Jersey, New Mexico, New York, North Carolina, Pennsylvania, Texas, Wisconsin; 29th, Alabama, California, Indiana, Louisiana, Maine, Massachusetts, Michigan, Minnesota, North Carolina, Ohio, Tennessee, Wisconsin; 30th, Connecticut, Minnesota, Ohio, North Carolina, Texas, Virginia; 31st, Alabama, Canada, Delaware, Indian Territory, Mississippi, North Carolina, South Carolina, Texas, Tennessee, Louisiana.

Mirage.—Georgia, Tybee Island, 3d, 4th, 9th; Nebraska, Genoa, 4th, 24th, 26th; Maine, Standish, 11th, 17th, 26th, 31st; Minnesota, Breckenridge, 15th, 22d, 25th, 27th; Massachusetts, New Bedford, 28th.

MISCELLANEOUS PHENOMENA.

Zoological.—*Wild geese* were observed at Baxter Springs, Kans., 5th and 6th, and flying south 29th; Sedgwick, Kans., northeast, 22d; Melissa, Tex., south, 5th and 30th, north 27th; Nashville, east, 18th; Corning, Mo., 25th; Abington, Ill., north, 29th; Havana, Ill., abundant three last days of month; Afton, Iowa, and Bennettsville, Ky., north, 31st. *Wild ducks*, Fort Macon, N. C., flying south 19th and 24th; New Bedford, Mass., seen in large numbers 29th and 30th; Golden, Colo., and Stanley, Kans., north, 30th; Havana, Ill., abundant three last days of month. *Bluebirds* seen at Weldon, N. C., 14th; Bennettsville, Ky., 16th; Austin, Tenn., 26th; Chambersburg, Pa., 27th; Cleaveland, Tenn., 28th; Accotink, Va., and Fallston, Md., 29th; Baxter Springs, Kans., and Morgantown, W. Va., 31st; Ringgold, Ohio, during last of month. *Robins* appeared at Morgantown, W. Va., 23d; Lynchburg, Va., 28th; Fort Madison, Iowa, 30th; Afton, Iowa, 31st. *Redbirds* appeared at Alto Vista, Va., 10th; Morgantown, W. Va., 23d. *Blackbirds* seen at Golden, Colo., flying northwest, 31st. *Mocking-birds* appeared at Welborn, Fla., 26th. *Golden-winged woodpecker* seen at Abingdon, Ill., 31st. *Bees* were out at Afton, Iowa, and Oregon, Mo., 31st. *Reptiles.*—Concerning the reported shower

of snakes at Memphis on the 15th, the following is taken from the observer's report: "Morning opened with light rain; 10.20 a. m. began to pour down in torrents, lasting fifteen minutes, wind southwest; immediately after the reptiles were discovered crawling on the sidewalks, in the road, gutters, and yards of Vance street, between Lauderdale and Goslee streets, two blocks; careful inquiry was made to ascertain if any one had seen them descend, but without success; neither were they to be found in the cisterns, on roofs, or any elevations above the ground; Vance street is comparatively new, has no pavements, gutters merely trenches. I heard of none being found elsewhere; when first seen they were a very dark brown, almost black; were very thick in some places, being tangled together like a mass of thread or yarn."

Meteors.—1st, Kentucky; 3d, Connecticut, Pennsylvania; 4th, Missouri; 5th, New York; 7th, Iowa; 8th, North Carolina; 9th, Pennsylvania; 13th, New Jersey; 15th, Iowa, West Virginia; 20th, Kentucky; 23d, Ohio; 24th, Massachusetts, New Jersey; 26th, Florida; 27th, Iowa, Louisiana; 30th, Kentucky, Pennsylvania.

Icebergs.—Latitude, 44° 15′ north, longitude 44° 40′ west, 23d.

Polar bands.—Maine, Gardiner, 1st, 8th, 12th, 21st, 27th; Wisconsin, Milwaukee, 2d; Virginia, Wytheville, 3d, 23d, 31st; Georgia, Tybee Island, 5th, 8th; Ohio, Carthagena, 6th, 9th, 14th, 18th, 21st, 25th, 27th; Florida, Daytona, 11th; Iowa, Guttenburg, 12th, 29th; Iowa City, 13th, 25th, 27th; Tabor, 31st; Minnesota, Duluth, 17th, 23d, 24th, 25th; Saint Paul, 26th; Kentucky, Benettsville, 25th; New Hampshire, Contoocookville, 31st.

Zodiacal light.—Georgia, Savannah, 2d, 4th, 30th; Massachusetts, Somerset, 4th, 5th, 7th, 9th; Florida, 5th; Ohio, Bellefontaine, 4th, 5th, 14th, 17th, 31st; New Jersey, Atco, 4th, 9th; New York, Waterburgh, 5th, 13th, 17th.

Published by order of the Secretary of War.

ALBERT J. MYER,
Brig. Gen. (Brevet Assigned), Chief Signal Officer, U. S. A.

PAPER 33.

MONTHLY WEATHER REVIEW, FEBRUARY, 1877.

INTRODUCTION.

In compiling the present review, the usual data, received up to March 14th, have been made use of. The most noticeable features for the month are the severe storms Nos. VIII, IX, and XI; the continuance of the warm weather, experienced the latter part of January, through the month of February, giving higher average temperatures for all the districts, excepting the South Atlantic and Gulf States; a general deficiency in the rain-fall, excepting Oregon; the absence of destructive freshets; the frequency of lunar halos from the 20th to the 26th; the hatching of grasshoppers in Minnesota, Iowa, Kansas, and Nebraska.

BAROMETRIC PRESSURE.

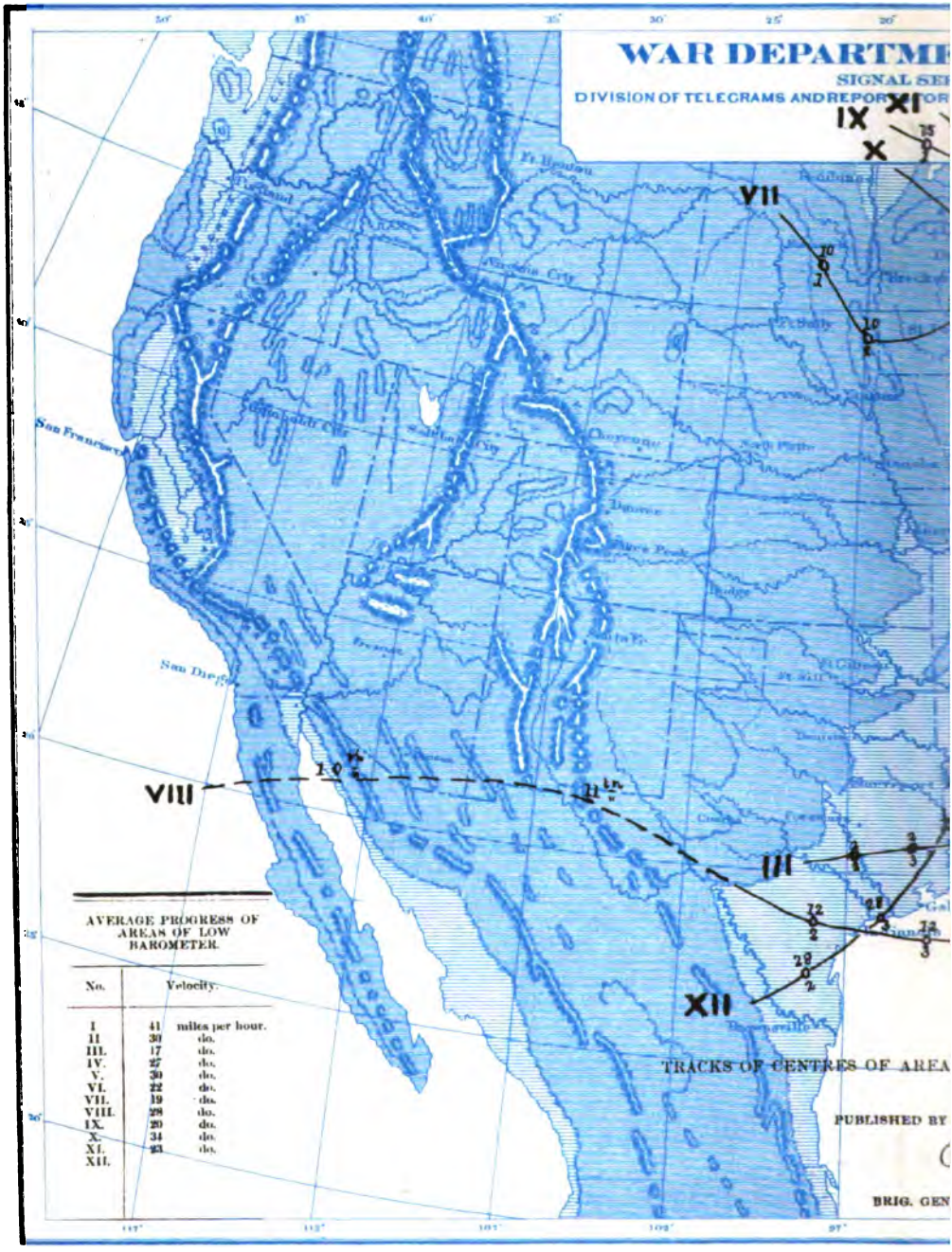
The general distribution is represented upon Chart No. II. The highest reading for the month, 30.88 inches, was observed at Alpena, at 7.35 a. m. of the 13th, during the progress eastward of high-pressure area No. VI; the lowest, 29.18 inches, at Eastport, on the 17th, during the passage of storm No. XI.

Ranges in barometer.—San Francisco, 0.59 inch; San Diego, 0.58; Rocky Mountain stations, 0.43 to 0.70; Plains of Kansas, Indian Territory, and Northern Texas, 0.74 to 0.96; Missouri Valley, 1.06 to 1.25; valley of the Red River of the North, 1.24 to 1.38; Upper Mississippi Valley, 1.06 to 1.39; Upper Lake region, 1.19 to 1.50; Lower Lake region, 0.98 to 1.21; Ohio Valley and Tennessee, 0.81 to 1.14; New England, 0.84 to 1.11; Middle States, 1.02 to 1.18; South Atlantic States, 0.65 to 1.05; Gulf States, 0.54 to 0.75; Key West, 0.45.

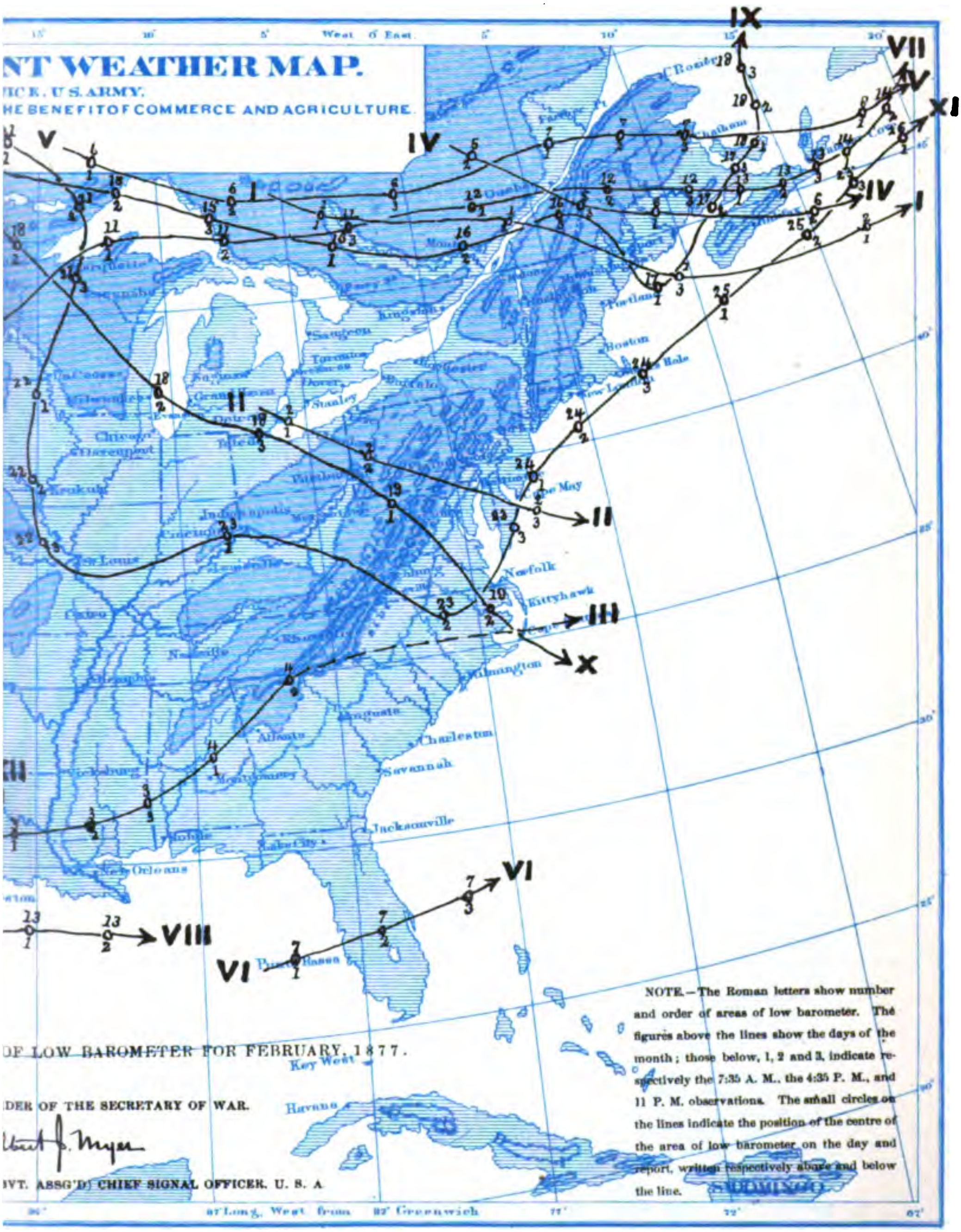
Areas of high pressure.—Of these, nine are described below. Nos. VI, VII, VIII, and IX were the most decided.

No. I.—In the review for January this high-pressure area was designated as No. VII. On the morning of the 1st instant it covered the Eastern Gulf and South Atlantic States and Eastern Tennessee. During the 1st, 2d, and 3d it gradually disappered in advance of low-pressure areas Nos. I, II, and III.

No. II.—It appeared in the Missouri Valley on the morning of the 2d, with freezing temperatures from Arizona, New Mexico, and Kansas northward and eastward to Wisconsin and Michigan; minimum, —3° at Pembina. On the following morning, with increased pressure, it covered the Northwest and Upper Lake region, with continued cold weather throughout the above-mentioned sections. At 7.35 a. m., 4th, the highest, above 30.40 inches, was central over the Lower Lake region, with the temperature


WAR DEPARTME
SIGNAL SE
DIVISION OF TELEGRAMS AND REPOR
IX
XI
X
VII
VIII
III
XII
San Francisco
San Diego
AVERAGE PROGRESS OF AREAS OF LOW BAROMETER.
No. Velocity.
I 41 miles per hour.
II 30 do.
III. 17 do.
IV. 27 do.
V. 30 do.
VI. 22 do.
VII. 19 do.
VIII. 28 do.
IX. 20 do.
X. 34 do.
XI. 23 do.
XII.
TRACKS OF CENTRES OF AREA
PUBLISHED BY
BRIG. GEN

No. I.


NT WEATHER MAP.
ICE, U.S. ARMY.
HE BENEFIT OF COMMERCE AND AGRICULTURE.
West 0 East
IX
VII
XI
IV
I
II
III
X
VI
VIII
V
Boston
Portland
Norfolk
Kittyhawk
Cape May
Wilmington
Charleston
Savannah
Jacksonville
Augusta
Atlanta
Montgomery
Vicksburg
Mobile
New Orleans
Memphis
Nashville
Cairo
St. Louis
Keokuk
Chicago
Milwaukee
Indianapolis
Cincinnati
Toledo
Buffalo
Toronto
Rochester
Kingston
Punta Rassa
Key West
Havana
DF LOW BAROMETER FOR FEBRUARY, 1877.
DER OF THE SECRETARY OF WAR.
VT. ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.
87 Long. West from 82 Greenwich
NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:35 A. M., the 4:35 P. M., and 11 P. M. observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.

generally below freezing from the Lake region eastward. By midnight it was central on the Middle Atlantic coast, after which it rapidly disappeared in advance of low pressure No. IV.

No. III.—During the 3d the pressure was unusually high at Portland, Oreg. It apparently moved eastward and reached the Upper Missouri Valley on the morning of the 4th. During the day it extended southward, and, on the morning of the 5th, covered the entire country between the Rocky Mountains and Mississippi Valley, with freezing temperature as far south as Indian Territory. It continued its southeastward march, and was central in the vicinity of Cairo at 7.35 a. m., 6th. Under the influence of low-pressure areas Nos. V and VI it was gradually dissipated, and lost its distinctive features during the day and night.

No. IV—appeared in the Lake region on the 7th, with temperatures below freezing at night; thence to the Middle and New England States; minimum, —2° at Parry Sound. During the 8th it was dissipated.

No. V.—It advanced southeastward over Dakota on the 7th. At 7.35 a. m., 8th, the maximum pressure, 30.49 inches, was reported from Yankton; minimum temperature, 04, from Breckenridge. It separated into two distinct areas in advance of low-pressure No. VII, which were central on the morning of the 9th over Lakes Huron, Erie, and Ontario, and in Texas. A light "norther" was produced along the Texas coast, night of the 8th and 9th, for which signals were ordered, although rather late; maximum velocity, 30 miles at Indianola. At 7 35 a. m., of the 10th, these areas covered the Southwest and the Middle Atlantic and Southern New England coasts. Morning of the 11th, with increased pressure, it covered the Southern and Middle States and the Ohio Valley, and was central in Eastern Tennessee. Heavy frosts occurred as far south as Northern Florida, and northeast gales off the South Atlantic coast—Tybee Island, northeast 54 miles. During the 11th and 12th, as storm No. VII was passing eastward over the northern districts, it lost its identity in the Southern States in advance of the following high-pressure area.

No. VI.—This is the most interesting high-pressure area of the month. Night of the 10th it evidently advanced southward from Manitoba, producing brisk and high northerly winds and rapidly falling temperature in Dakota and Minnesota, in connection with storm No. VII. Morning of the 11th, minimum temperature, —8° at Pembina. During the day it continued southward. At 7.35 a. m., 12th, it was central in the vicinity of Breckenridge, with a barometric reading of 30.84 inches, and at Pembina a minimum temperature of —24°. During the 12th its progress was eastward over the Lake region, due to the presence of the disturbance in the Southwest, and charted as No. VIII. High northwesterly winds and gales accompanied its advance. Morning of the 13th, the highest pressure covered Lake Huron; at Alpena, 30.88 inches. Minimum temperature, —5° at Rockliffe, Canada, and below freezing as far south as Virginia, Kentucky, Missouri, Kansas, and New Mexico. During the night of the 12th and 13th high northwest and northerly winds and severe gales were produced in the Atlantic States from North Carolina northeastward, in connection with storm No. VII. At 7.35 a. m., 14th, it reached from Virginia northward over Lakes Ontario, Erie, and Huron into Canada, with the highest reading of 30.71 inches at Kingston, and with minimum temperatures of 4° at Albany and —13° at Rockliffe, Canada. Morning of the 15th the isobaric curve, 30.40 inches, included the country from Southwestern New England to South Carolina. During the 15th, under the influence of storm No. IX, which was passing eastward and north of the Lake region, it disappeared on the Middle Atlantic coast.

No. VII.—On the 14th it was apparently felt at Portland, Oreg., whence it moved southeastward, and reached the Missouri Valley during the night of the 15th. At 7.35 a. m., 16th, it covered the country from the Rocky Mountains to the Mississippi Valley, and was highest in Nebraska and Kansas, with the temperature below freezing from the Upper Lakes west and southwestward to New Mexico; minimum —15° at Fort Garry. Its course was southeastward, and on the following morning central in the Southwest. It covered the Southern States morning of the 18th, and was highest over Louisiana, with heavy frost in Northern Florida. During the day and night it gradually disappeared on the Western Gulf coast, apparently dissipated as storm No. X moved southeastward across the country. Signals were displayed on the 16th, at Indianola and Galveston for a light "norther," but barely justified at the former alone.

No. VIII.—During the 18th it appeared in the extreme Northwest, in rear of storm No. X, and was central in Dakota the following morning. The 19th it moved southeastward, and signals were displayed on the Texas coast for a "norther," which were justified by high northerly winds. At 7.35 a. m., 20th, it covered the country from the Lakes to Texas, and was highest, about 30.50 inches, in Kansas. Morning of the 21st it was central in Louisiana, but with slowly diminishing pressure, and heavy frosts in Northern Florida. As storm No. XI approached the Upper Lake region and moved southward it disappeared, on the 21st, along the Gulf coast.

No. IX.—This was the most extensive high-pressure area of the month. It was first felt in Manitoba, morning of the 22d. After storm No. IX passed eastward this area

extended its influence southeastward during the 23d, 24th, and 25th. The minimum temperature of —8° occurred at Pembina, a. m. of the 23d. The pressure reached its maximum, of 30.72 inches, at Fort Garry, morning of the 26th, with the barometric ridge covering the Mississippi Valley. Cautionary signals were ordered on the Texas coast for light "northers" on the 22d, 23d, and 26th, but not justified by subsequent dangerous winds. At 7.35 a. m., 27th, this area included the entire country east of the Rocky Mountains, with very generally clear and cold weather, and continued highest in Manitoba; minimum temperature, —1° at Pembina. On the morning of the 28th isobaric curve, 30.30 inches, included the country from the Upper Lake region to Western Tennessee, and to the eastern portions of Kansas and Nebraska. At midnight it was central in Ohio and West Virginia. From the 22d to the 25th the barometric gradient between this area and storm No. XI was very steep, resulting in high northwesterly winds and gales.

Areas of low pressure.—The tracks of the centers of twelve have been charted. Storms Nos. VII, IX, and XI were very severe from the Lakes to the Middle Atlantic and New England coasts and Gulf of Saint Lawrence, especially the last, which produced severe easterly gales from North Carolina northeastward, with heavy rains changing to heavy snow north of New Jersey.

No. I.—This is a continuation of the low-pressure area designated as No. XIV in the January Review. During the 1st, light rains fell along Lake Huron, New York, New Jersey, and New England, and rain, partly changing into snow, from the Saint Lawrence Valley to Nova Scotia. Brisk to high winds were reported from the Lower Lakes and Saint Lawrence Valley. Signals had been ordered to be displayed the previous night from Boston to Eastport, and Canadian stations warned, but were not justified. On the 2d it disappeared to the south and east of Nova Scotia.

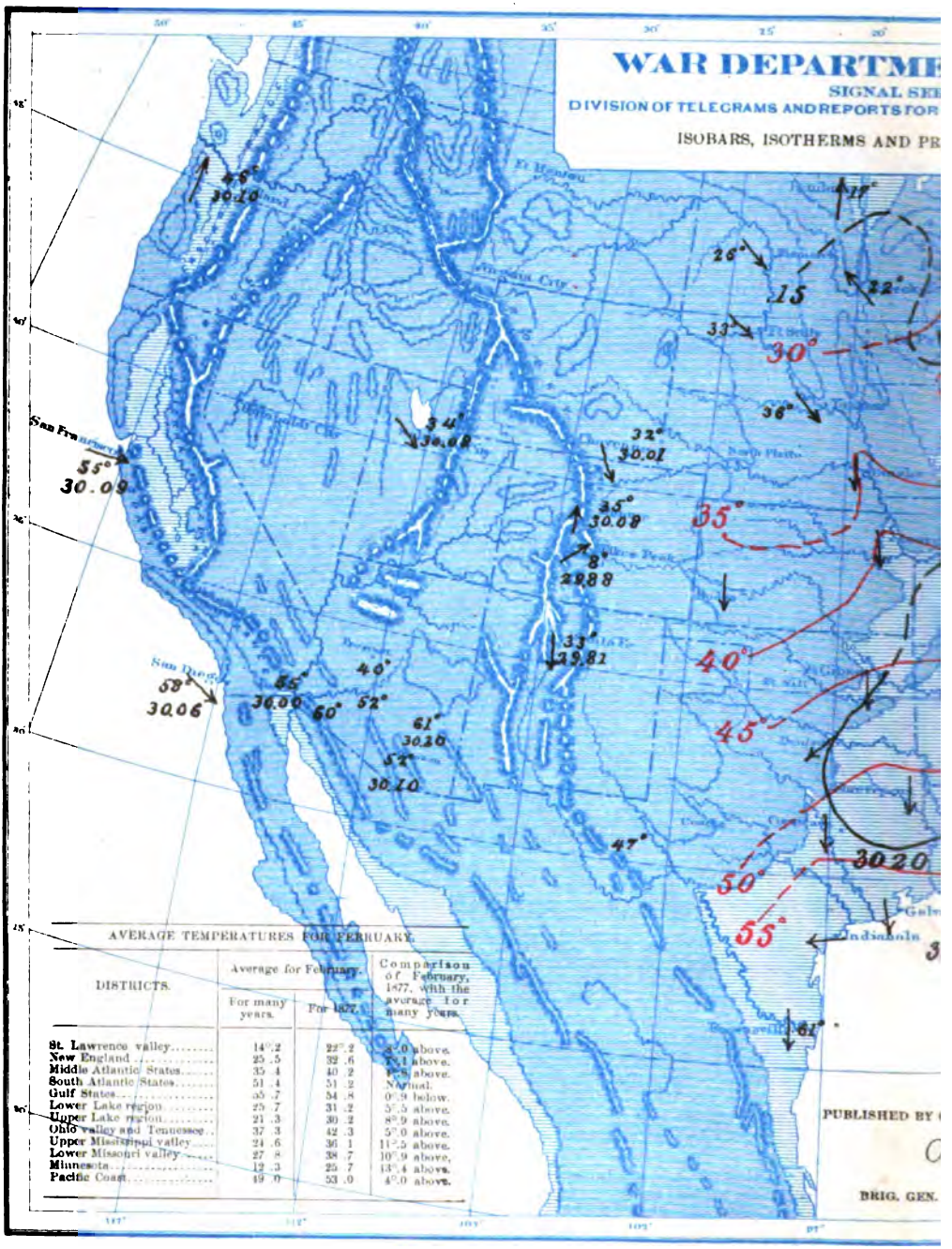
No. II.—During the night of the 1st this slight disturbance developed in the Lake region, with occasional thunder-storms in Illinois and Indiana. The 2d, threatening and rainy weather prevailed from Lake Erie to Tennessee, the Middle States and Southern New England, and light snows fell along Lake Huron. At night it disappeared off the Middle Atlantic coast. So far as known, dangerous winds did not accompany it.

No. III.—Threatening and rainy weather, at places very heavy, prevailed in Texas and Indian Territory on the 1st. By afternoon of the 2d the central depression was south of Corsicana, and the rain-area extended eastward into the Lower Mississippi Valley. Cautionary signals were displayed on the Texas coast for a light "norther," but not justified. During the 3d, threatening and rainy weather was reported as far eastward as Tennessee and the North Atlantic States, and clear or clearing weather from the Southwest. The 4th, signals were ordered for the North Carolina coast, but rather late and lowered too soon; maximum velocities at Kittyhawk northeast 30, and Cape Hatteras northeast 44 miles. During this day rainy weather continued in the South Atlantic States, clearing weather followed from Tennessee to the Gulf, and at midnight it appeared as an elongated depression reaching from Southern Ohio to Northeastern Florida. At night the rain-fall was very heavy along the North Carolina coast, over which it passed into the Atlantic on the 5th. Off Cape Carnaveral, Fla., heavy north and northeast gales were experienced.

No. IV.—Diminishing pressure, southerly winds, and increasing cloudiness in the Lake region and Saint Lawrence Valley, on the 4th and 5th, indicated the approach of a disturbance from Canada. At midnight, 5th, it was central in the vicinity of Quebec. During the 6th it disappeared eastward over Nova Scotia, accompanied by frequent light snow from the northern portion of New York east and northeastward. It was followed by high westerly winds at places, and on Mount Washington a northwest storm.

No. V.—This storm moved southeastward over Manitoba during the night of the 5th. Although its center passed at some distance north of the Lakes on the 6th, yet cloudy and threatening weather and brisk to high southerly or westerly winds were produced in that section. Canadian stations were warned of its approach, and the signals displayed at Milwaukee and Grand Haven were justified; maximum velocities, Escanaba west 28, and Grand Haven southwest 27 miles. 7th, light snows fell in Northern New York and New England, Saint Lawrence Valley, New Brunswick, and Nova Scotia, with high winds occasionally, viz: Sandy Hook west 28 miles, Mount Washington northwest storm, and on the 8th at Thatcher's Island northwest 36 miles.

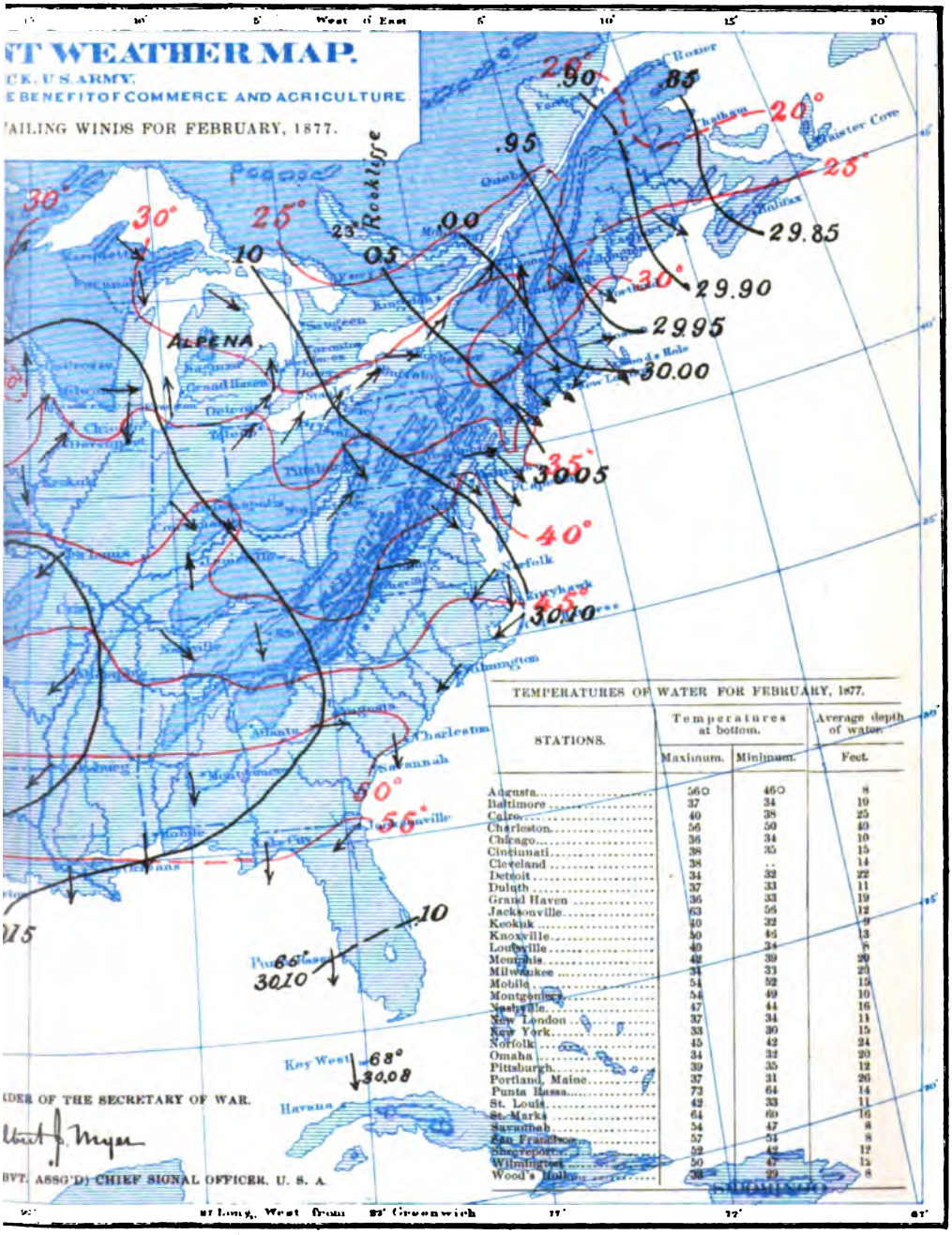
No. VI.—During the 7th this storm crossed Florida, accompanied by rainy weather, thence to the South Carolina coast, and thunder-storms in Florida. Signals were ordered from Key West and Saint Mark's to Charleston, but justified at Tybee Island alone. At Punta Rassa an hourly wind velocity of 30 miles was recorded at 4.35 p. m. On the morning of the 8th, in connection with high pressure No. IV, high winds were produced on the North Carolina coast; at Cape Hatteras northeast 34 miles. It is probable that it passed northeastward over Bermuda, where a very destructive northerly gale occurred on the 10th. For several days previous, heavy showers had pre-



AVERAGE TEMPERATURES FOR FEBRUARY.

DISTRICTS.	Average for February. For many years.	Average for February. For 1877.	Comparison of February, 1877, with the average for many years.
St. Lawrence valley	14°.2	22°.2	8°.0 above.
New England	25 .5	32 .6	7°.1 above.
Middle Atlantic States	35 .4	40 .2	4°.8 above.
South Atlantic States	51 .4	51 .2	Normal.
Gulf States	55 .7	54 .8	0°.9 below.
Lower Lake region	25 .7	31 .2	5°.5 above.
Upper Lake region	21 .3	30 .2	8°.9 above.
Ohio valley and Tennessee	37 .3	42 .3	5°.0 above.
Upper Mississippi valley	24 .6	36 .1	11°.5 above.
Lower Missouri valley	27 .8	38 .7	10°.9 above.
Minnesota	12 .3	25 .7	13°.4 above.
Pacific Coast	49 .0	53 .0	4°.0 above.

No. II.



TEMPERATURES OF WATER FOR FEBRUARY, 1877.

STATIONS.	Temperatures at bottom.		Average depth of water.
	Maximum.	Minimum.	Feet.
Augusta	56°	46°	8
Baltimore	37	34	19
Cairo	40	38	25
Charleston	56	50	40
Chicago	36	34	10
Cincinnati	38	35	15
Cleveland	38	..	14
Detroit	34	32	22
Duluth	37	33	11
Grand Haven	36	33	19
Jacksonville	63	56	12
Keokuk	40	32	9
Knoxville	50	46	13
Louisville	40	34	6
Memphis	48	39	20
Milwaukee	34	33	23
Mobile	54	52	15
Montgomery	54	49	10
Nashville	47	44	16
New London	37	34	11
New York	38	30	15
Norfolk	45	42	24
Omaha	34	32	20
Pittsburgh	39	35	12
Portland, Maine	37	31	26
Punta Rassa	73	64	14
St. Louis	42	33	11
St. Marks	64	60	16
Savannah	54	47	8
San Francisco	57	51	8
Shreveport	52	42	12
Wilmington	50	42	15
Wood's Holl	38	29	8

vailed, with easterly winds veering to southerly, and morning of the 10th heavy thunder-storms.

No. VII.—During the night of the 8th rainy weather prevailed at Portland, Oreg. This storm probably crossed Northern Montana on the 9th. Decreasing pressure and increasing, warm southerly winds throughout the Northwest and Upper Lake region indicated its approach. Heavy snow fell at Virginia City the 10th, and the central depression passed over Dakota to Southern Minnesota. To the westward brisk and high northerly winds, with cold weather, prevailed; to the eastward increasing, warm southerly winds. During the 11th, as the central depression passed eastward, a barometric trough extended toward Texas, in which the precipitation was very light. Maximum velocities, Grand Haven northwest 32, Milwaukee northwest 27, Escanaba north 32 miles, for which there was a failure to display signals. High pressure No. VI succeeded this storm very rapidly, causing a very steep barometric gradient between them, and, as a result, severe westerly and northerly gales on the 12th and 13th from the Lower Lakes to the Middle Atlantic and New England coasts and Gulf of Saint Lawrence. Threatening weather, with frequent light rain or snow accompanied them, changing to heavy snow in the vicinity of the mouth of the Saint Lawrence. Cautionary signals were ordered on the 12th from North Carolina to Maine, and some of the Canadian stations notified of its approach, with the following result: Erie west 36, Father Point north 50, Eastport northwest 40, Boston and Thatcher's Island northwest 48, Wood's Holl southwest 36, New London northwest 38, New York northwest 46, Flushing, N. Y., northwest 54, Sandy Hook northwest 60, Barnegat northwest 39, Cape May northwest 64, Cape Henry north 44, Kittyhawk north 50, Cape Lookout northeast 40. The lowest barometric reading, 29.47 inches, occurred at Halifax at 4.35 p. m., 13th. Northerly gales continued in the Atlantic States and Gulf of Saint Lawrence during the 13th, diminishing in force at night. On Mount Washington a velocity of northwest 120 miles was recorded. The storm-center passed eastward beyond Nova Scotia on the 14th, with a continued northwest hurricane on Mount Washington.

No. VIII.—The center of this disturbance apparently moved to the southward of California, Arizonia, and New Mexico, in the southern portions of which threatening and rainy weather accompanied it on the 10th. At Santa Fé there was a heavy snow-fall during the 11th, with the rain-area covering Texas, Indian Territory, and westward, and with thunder-storms in former. The 12th light snow fell in New Mexico and Kansas, with rainy weather thence to Lower Mississippi Valley and Texas coast. The central depression crossed Texas. Cautionary signals displayed from midnight of the 11th at Indianola and Galveston for a "norther" were justified by subsequent wind-velocities of north 34 miles. During the 13th threatening and rainy weather prevailed in the Gulf States. The center disappeared into the Gulf, evidently under the influence of high pressure No. VI, which covered the entire country to the northward. Northeasterly gales were reported from Florida to the North Carolina coast; maximum, Tybee Island, 36 miles. Frequent light rains fell on the 14th in the Gulf States, South Atlantic States, and Tennessee, and continued the 15th in Florida, South Carolina, and Georgia, with thunder-storms in last, and with gales on the coast; maximum, northeast 40 miles at Tybee Island, and northeast 38 at Kittyhawk. Clearing weather was reported the 16th.

No. IX.—This storm approached the Lake region from Manitoba during the 15th, producing occasional light snow or rain. On the morning of the 16th signals were ordered for Lake Michigan, but late; at night from North Carolina to Rhode Island, and morning of the 17th from thence to Maine. Warnings were also sent to Canadian stations along Lakes Huron, Erie, and Ontario, Halifax and Saint John, N. B. They were all justified. Some of the maximum velocities recorded are: Duluth northwest 38, Marquette west 48, Milwaukee northwest 40, Alpena northwest 31, Cleveland west 30, Father Point northeast 32, Thatcher's Island northwest 36, Mount Washington northwest hurricane, New York northwest 48, Sandy Hook northwest 50, Cape May northwest 52, Cape Henry northwest 44, Kittyhawk north 48 miles, and latitude 39° 37′ north, longitude 67° west, heavy southeast gale, veering to west-southwest. Light snow or rain fell on the 16th from Lake Huron to New York and Northern New England; heavy snow the 17th from the mouth of the Saint Lawrence to Eastern Maine, and partly changing to rain in Nova Scotia. The 17th, 18th, and 19th its progress northeast and northward over the Gulf of Saint Lawrence was very slow. On Mount Washington the maximum hourly wind-velocity of the month, 132 miles, was reached on the 18th. From the 16th to the 17th the central depression was very much diminished, which, taken in connection with the reports of gales and hurricanes off the coast on the 16th, and the northwesterly gales along the coast on the 16th and 17th, would seem to indicate the approach of a storm-center from the southward, and that the two apparently combined.

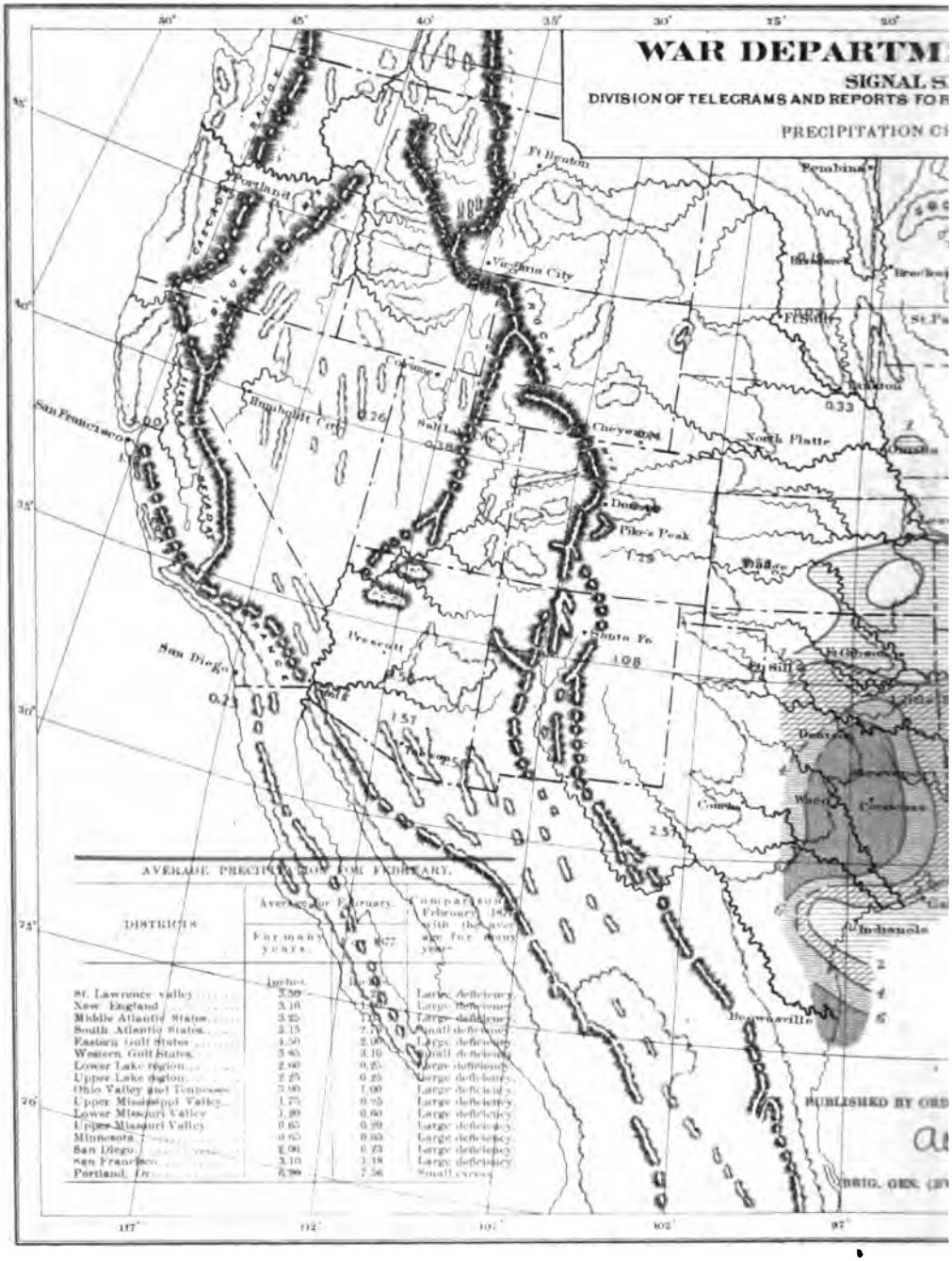
No. X.—Similar to the last, this appeared in Manitoba, night of the 17th. Morning of the 18th signals were raised at Milwaukee and Grand Haven, and justified; at latter south 29 miles. During this day snow fell from Lake Superior to the Lower Lakes. At midnight and the following morning signals were ordered from North Carolina to

Massachusetts, the majority of which were reported justified; maximum velocities Cape Lookout southwest 40, Kittyhawk north 44, Cape May north 40, Barnegat north 34, Port Huron north 34, and Erie north 32 miles. Very light precipitation, in the form of rain, accompanied it on the 19th from the Middle States and North Carolina to the central Gulf States, with thunder-storms at night in South Carolina and Georgia. Clearing weather succeeded it on the morning of the 20th in the East Gulf and South Atlantic States. During the day vessels experienced in latitude 34° north, longitude 74° west, heavy south-southwest gale, veering to north-northeast, and 30° 40′ north, 79° 30′ west, strong north gale.

No. XI.—The path of this storm was a remarkable one. Apparently it was felt at Portland, Oreg., where heavy rains fell during the 19th and 20th; night of the 20th light rain at Salt Lake City and light snow at Virginia City. Warm, southerly winds and falling barometer from Kansas to Manitoba indicated its approach, and morning of the 21st it was apparently central north of Minnesota. During the afternoon threatening and rainy weather, with brisk and high northerly winds, prevailed from Manitoba to Nebraska. By midnight it was central near Duluth, with a barometric trough extending toward Texas, when signals were ordered for Milwaukee and Grand Haven. Maximum velocities occurred at Fort Sully northwest 45, Pike's Peak gale, North Platte, northwest 44, Escanaba and Dodge City north 38, and Grand Haven south 31 miles. During the 22d clearing weather was reported from Dakota and Minnesota, and the rain-area extended southward to the central and eastern Gulf States, with brisk and high northerly winds from Northern Texas to Dakota and Minnesota. Signals displayed on the Texas coast for a "norther" on the 22d and 23d, were reported as not justified. The latter date, as the storm approached the coast, it became very severe, and was accompanied by heavy rains, with thunder-storms from Virginia to New Jersey. Signals were ordered from North Carolina to Maine, and fully justified. Maximum velocities: Cape Lookout southwest 34, Cape Hatteras southeast 40, Cape May east 36, and northwest 44, Philadelphia east 44, Atlantic City and Barnegat east 52, Sandy Hook northeast 59, New York northeast 48, Flushing, N. Y., northeast 75, New London, Boston, and Portland northeast 36, and Eastport northeast 34 miles. During the 24th the rain very generally changed to heavy snow from Pennsylvania northeastward. The 25th it was succeeded by clearing but cloudy weather in the Middle and Eastern States and Saint Lawrence Valley. Minimum barometer, 29.36 inches, occurred at 7.35 a. m. of the 24th on the New Jersey coast, while off the coast on board the schooner Addie Fuller it was reported as low as 29.24 inches.

No. XII.—During the night of the 25th this storm produced light rains along the California coast, and occasional thunder-storms. The 26th rainy weather was reported from Utah, Arizona, New Mexico, and the southwestern portion of Texas, and light snow from Northern New Mexico to Western Nebraska and Southern Wyoming. The 27th rainy weather continued from the southwestern half of Texas to Arizona, and snow fell at Virginia City; in Texas thunder-storms accompanied it. During the 28th clearing-up weather followed in Arizona, Utah, and New Mexico; the rain area included Kansas, Indian Territory, Louisiana, and Texas, with thunder-storms in last. At midnight it was central between Galveston and Indianola, with a barometric trough extending toward Dakota, and light rain or snow commenced falling in the northern portions of Minnesota and Dakota. During the 1st and 2d of March it progressed northward toward Lake Huron and thence northeastward, and increased very much in extent and severity, including the entire country east of the Rocky Mountains, but its subsequent history belongs to March. Cautionary signals were ordered for the Texas coast morning of the 28th, and justified at Indianola alone by a velocity of northwest 31 miles.

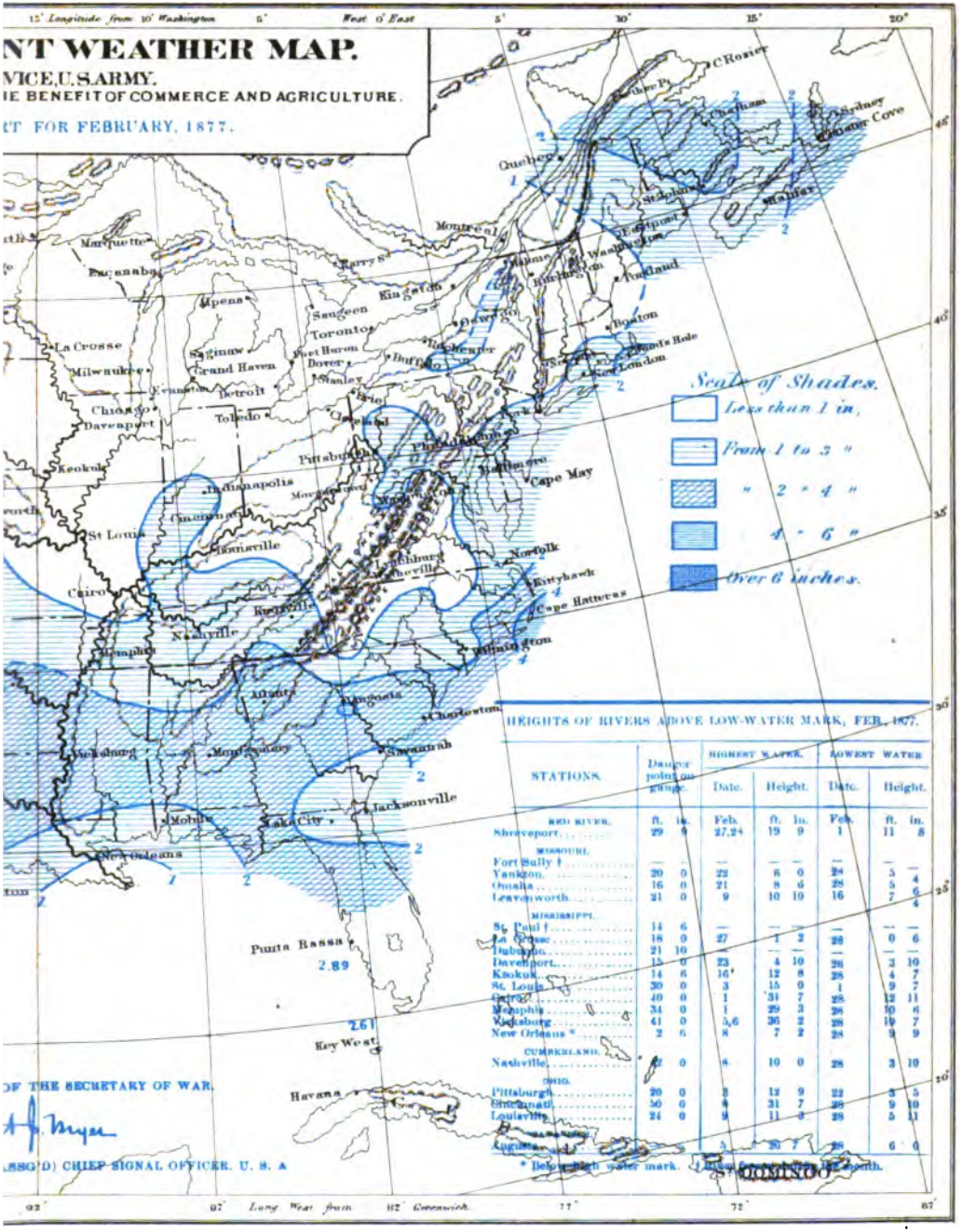
Vessels experiencing storms at sea.—Reports of same have been numerous, of which the following are given: 2d, latitude 51° 15′ N., longitude 12° W., strong W. to SW. gales, with heavy squalls of hail and high sea for three days. 4th, 51° 26′ N., 13° 29′ W., strong W. gale and high sea. 9th, 44° N., 45° 33′ W., strong W. gales, high seas, and snow squalls; 44° 30′ N., 46° 21′ W., strong WNW. gale and high sea. 10th, 44° 44′ N., 50° 30′ W., heavy WNW. gale for three days; 49° N., 29° W., hurricane NW.; 42° 28′ N., 48° 52′ W., strong W. by N. gales and high seas; 46° 09′ N., 42° 45′ W., strong WNW. gale and high seas; off Bermuda, heavy SE. shifting to NW. gale. 11th, 47° 06′ N., 35° 52′ W., strong W. gale, hail, and high sea; in the Straits of Florida, severe NE. gale until 15th. 13th, 39° 17′ N., 73° W., heavy NW. gale; 41° N., 67° 27′ W., strong NW. gale; 48° 53′ N., 36° 25′ W., strong N. gale and high sea, 50° 30′ N., 18° 49′ W., strong WSW. gale; 25° 30′ N., 66° 41′ W., severe NE. gale; 20° 09′ N., 53° 49′ W., heavy SSW. gale veering to NW. 14th, 40° 31′ N., 68° 36′ W., strong NNW. gale, heavy sea, and snow squalls. 15th, 45° 30′ N., 39° 10′ W., cyclone lasting four hours. 16th, 39° 37′ N., 67° W., heavy SE. to WSW. gale; 34° N.. 70° 30′ W., hurricane NE. to S.; near Bermuda, heavy gale. 18th, 27° 01′ N., 61° 55′ W., heavy NW. gale for twelve hours, then veering to NE. 19th, 43° 04′ N., 45° 52′ W., strong SW. to SSE. gale. 20th, 30° 40′ N., 79° 30′ W., strong N. gale; 34° N., 74° W., heavy SSW. gale for eight hours, then veering to NNE. for thirty hours. 28th, 45° 10′ N., 50° 25′ W., strong NW. gale, snow squalls, and high NW. sea.



AVERAGE PRECIPITATION FOR FEBRUARY.

DISTRICTS	Average for February. For many years.	1877.	Comparison of February, 1877, with the average for many years.
	Inches.	Inches.	
St. Lawrence valley	2.30	1.70	Large deficiency.
New England	3.16	1.60	Large deficiency.
Middle Atlantic States	3.25	1.15	Large deficiency.
South Atlantic States	3.15	7.75	Small deficiency.
Eastern Gulf States	4.50	2.00	Large deficiency.
Western Gulf States	3.45	3.10	Small deficiency.
Lower Lake region	2.60	0.25	Large deficiency.
Upper Lake region	2.25	0.25	Large deficiency.
Ohio Valley and Tennessee	3.00	1.00	Large deficiency.
Upper Mississippi Valley	1.75	0.75	Large deficiency.
Lower Missouri Valley	1.20	0.60	Large deficiency.
Upper Missouri Valley	0.65	0.20	Large deficiency.
Minnesota	0.65	0.05	Large deficiency.
San Diego	0.90	0.23	Large deficiency.
San Francisco	3.10	1.18	Large deficiency.
Portland, Or.	6.80	7.56	Small excess.

No. 111.



HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, FEB., 1877.

STATIONS.	Danger point on gauge.		HIGHEST WATER.			LOWEST WATER.		
			Date.	Height.		Date.	Height.	
RED RIVER.	ft.	in.	Feb.	ft.	in.	Feb.	ft.	in.
Shreveport	29	0	27,28	19	9	1	11	8
MISSOURI.								
Fort Sully †	—	—	—	—	—	—	—	—
Yankton	20	0	22	6	0	24	5	—
Omaha	16	0	21	8	6	28	5	4
Leavenworth	21	0	9	10	10	16	7	6
MISSISSIPPI.							4	
St. Paul †	14	6	—	—	—	—	—	—
La Crosse	18	0	27	1	2	28	0	6
Dubuque	21	10	—	—	—	—	—	—
Davenport	15	0	23	4	10	26	3	10
Keokuk	14	6	16*	12	8	28	4	7
St. Louis	30	0	3	15	0	1	9	7
Cairo	40	0	1	31	7	28	12	11
Memphis	34	0	1	29	3	28	10	6
Vicksburg	41	0	5,6	36	2	28	19	7
New Orleans *	2	6	8	7	2	28	3	9
CUMBERLAND.								
Nashville	40	0	8	10	0	28	3	10
OHIO.								
Pittsburgh	20	0	3	12	9	22	3	5
Cincinnati	50	0	4	31	7	28	9	10
Louisville	24	0	4	11	3	28	5	11
[illegible]								
[illegible]			5	20	7	28	6	0

* Below high water mark. † Below zero of gauge. ‡ Frozen.

OF THE SECRETARY OF WAR.

A. Myer

(BRIG'D) CHIEF SIGNAL OFFICER, U. S. A.

TEMPERATURE OF THE AIR.

The isothermal curves and figures upon Chart No. II illustrate the general distribution of the temperature of the air for the present month. A reference to the table upon the same chart will show that the average is above that for many years, excepting the South Atlantic and Gulf States, especially for the northern districts. For the Gulf States alone the average is lower than usual.

Minimum and maximum temperatures, respectively, for the month: In Maine, Orono, —4°, 40°; Portland, 12°, 49°. New Hampshire, Mount Washington, —16°, 35°; Auburn, 4°, 64°. Vermont, Woodstock, —7°, 50°; West Charlotte, 5°, 53°. Massachusetts, Williamstown, 3°, 48°; Milton, 16°, 58°. Rhode Island, Fort Adams, 14°, 48°; Newport, 16°, 46°. Connecticut, Colebrook, 9°, 45°; Mystic, 12°, 56°. New York, Rodman, —8°, 58°; New York, 16°, 59°. New Jersey, New Brunswick, 9°, 53°; Salem, 16°, 62°. Pennsylvania, Tioga, —5°, 57°; Carlisle, 19°, 68°. Delaware, Dover, 18°, 64°. Maryland, New Market, 12°, 62°; Baltimore, 18°, 63°. District of Columbia, Washington, 20°, 67°. Virginia, Snowville, 12°, 64°; Fort Monroe, 26°, 72°. West Virginia, Salem, 14°, 66°; Weston, 16°, 65°. Ohio, Salem, 8°, 59°; Kenton, 16°, 67°. Indiana, Richmond, 19°, 60°; Saint Meinrad, 23°, 70°. Illinois, Riley, 12°, 56°; Carbondale, 20°, 73°. Michigan, Northport, 3°, 48°; Detroit, 16°, 58°. Wisconsin, Neillsville, 5°, 50°; Embarrass, 8°, 64°. Minnesota, Fort Ripley, —20°, 49°; Fort Snelling, 8°, 58°. Iowa, Cresco, 5°, 52°; Muscatine, 16°, 63°. Missouri, Corning, 13°, 65°; Saint Louis, 27°, 69°. Nebraska, Norfolk, 9°, 57°; Howard, 14°, 64°. Kansas, Fort Hays, 16°, 62°; Great Bend, 19°, 69°. Kentucky, Danville, 21°, 67°; Louisville, 24°, 68°. Tennessee, Knoxville, 22°, 62°; Memphis, 30°, 67°. North Carolina, Franklin, 15°, 61°; Wilmington, 23°, 71°. South Carolina, Spartanburg, 23°, 66°; Charleston, 35°, 70°. Georgia, Atlanta, 25°, 68°; Saint Mary's, 34°, 76°. Florida, Milton, 29°, 75°; Key West, 57°, 80°. Alabama, Green Springs, 26°, 68°; Carlowville, 32°, 73°. Mississippi, Vicksburg, 31°, 73°. Louisiana, Baton Rouge, 29°, 78°; Lake Charles, 38°, 78°. Texas, Fort Richardson, 18°, 66°; Fort Brown, 37°, 81°. Arkansas, Mount Ida, 21°, 68°; Monticello, 23°, 71°. Indian Territory, Fort Sill, 19°, 69°; Fort Gibson, 26°, 65°. New Mexico, Fort Union, 2°, 59°; Santa Fé, 19°, 56°. Colorado, Pike's Peak, —8°, 22°; Golden, 20°, 66°. Wyoming Territory, Fort Bridger, —3°, 54°; Fort Fred Steele, 6°, 57°. Dakota Territory, Pembina, —24°, 42°; Fort Sully, 3°, 62°. Utah, Coalville, —4°, 56°; Salt Lake City, 15°, 55°. Montana, Virginia City, —5°, 49°. Nevada, Camp Halleck, 4°, 59°; Camp McDermit, 15°, 60°. California, Cloverdale, 34°, 74°; San Diego, 45°, 78°.

Ice.—At Boonesboro, Iowa, on the Des Moines River, had been from 22 to 30 inches thick; broke up on the 2d. Flushing, N. Y., on Flushing Bay, 14 inches thick; 11th. Wappinger's Falls, N. Y., pond ice, 18 inches thick, 16th; ice on Hudson River honeycombed and open in places, 21st. Oregon, Pa., pond ice 20 inches thich, 28th. Lunenburg, Vt., ice on ponds and streams 24 inches thick, 28th. Ice harvested 12 to 13 inches thick on Lake Champlain, at West Charlotte, Vt.

Frost in the ground.—At Council Grove, Kans., frost out of the ground, 2d. Sandy Springs, Md., in southern exposures, frost disappeared from ground by 10th. Howard, Nebr., frost nearly out of ground by 20th. Keokuk, frost out of ground, 21st. Flushing, N. Y., no frost in ground, 22d. Kenton, Ohio, frost out of ground, 25th. Clear Creek, Nebr., during winter ground frozen to a depth of 30 inches, at close of month had thawed 8 or 10 inches. Freehold, N. J., no frost in ground to a depth of 6 inches. Brookhaven, N. Y., frost out of ground, and South Hartford, N. Y., ground having been protected so long by snow, the frost is largely out of ground.

PRECIPITATION.

Upon Chart No. III is represented the amount of rain-fall, including melted snow For Virginia City the total is 0.73 inches. At Portland, Oreg., the fall has exceeded the average. In the remaining sections there has been a deficiency.

Stations reporting the precipitation zero or not sufficient to measure.—Fort Wayne (Detroit), Port Huron, and Litchfield, Mich.; Fort Ripley, New Ulm, and Minneapolis, Minn.; Independence, Iowa; Webster, N. C.; Beloit, Wis.; Camp Sheridan, Nebr.; Fort Laramie, Fort Sanders, and Camp Stambaugh, Wyo.

Stations reporting one-tenth of an inch, or less, of precipitation for the month.—Fort Abercrombie, Fort Seward, Pembina, and Firesteel, Dak.; Fort Snelling, Duluth, Saint Paul, and Breckenridge, Minn.; Fort Fred Steele, Wyo.; South Pueblo, Colo.; Chicago, Rockford, Riley, Havana, and Peoria, Ill.; Fort Wayne, Ind.; Rockford, Independence, Cresco, and Davenport, Iowa; Detroit, Grand Rapids, Northport, and Grand Haven, Mich.; Wet Glaze, Mo.; Vermillion, N. Y.; Little Mountain, Hudson, and Toledo, Ohio; Snowville, Va.; Bloomfield, Wautoma, Neillsville, and Milwaukee, Wis.; Rockliffe and Kingston, Canada.

Maximum rain-falls for the month.—Melissa, Tex., 13.06 (?); Brownsville, Tex., 7.99; Portland, Oreg., 7.56; Austin, Tex., 6.94; Denison, 6.89; Corsicana, 6.84; New Ulm, Tex., 6.75; Boerne, Tex., 6.46; Cape Hatteras, 5.85 inches.

Heavy rains.—Melissa, Tex., from 7 a. m. 1st to 12.30 p. m. 3d, 5 inches, and 9 a. m. 11th to 3 p. m. 13th, 7.31 inches. Austin, Tex., from 9 p. m. 1st to 7 a. m. 2d, 2 inches; 7 a. m. 11th to 7 p. m. 12th, 2.24 inches, and 12 m. 27th to 12 night 28th, 2.70 inches. New Ulm, Tex., from 1.30 p. m. 11th to 8 p. m. 12th, 3.62. Corsicana, 28th, 2.20 inches. Denison, 1st and 2d, 3.28 inches, and 12th, 2.26 inches. Cape Hatteras, 5th, 3.17 inches, and 16th, 2.45 inches.

Snow-fall for the month varies as follows: From Maine to the northern portions of New York and Pennsylvania, 0.5 to 10 inches; Southern New England to Maryland, 0 to 8; West Virginia, 3; Western North Carolina, 1.5 to 3.5; Ohio, 0.5 to 1; Upper Lake region, 0.25 to 3; Illinois and Missouri, 0 to 1; Iowa and Eastern Nebraska, 0.25 to 2.5; Kansas, 1.25 to 5; Colorado, at Golden, 5, and Summit, 33; Utah, at Coalville, 2 inches.

Depth of snow at close of month.—In Northern New England reports vary from 12 to 22 inches; in Southern New England, 0 to 10; northern portions of New York and Pennsylvania, 2 to 20; Upper Lake region, 0 to 0.5; Coalville, Utah, 1 inch.

Cloudy days.—The number of days on which the cloudiness has averaged eight-tenths or more, as reported by the volunteer observers, ranges as follows: New England, 2 to 16; Middle States, 3 to 12; South Atlantic States, 2 to 14; Gulf States, 7 to 14; Arkansas, Tennessee, and the Ohio Valley, 3 to 11; Upper Lake region, 4 to 8; Northwest, 1 to 12 days.

Rainy days.—The number of days during the month on which rain or snow, in any quantity, has fallen, ranges as follows for the Signal-Service stations: New England, 3 to 15; Middle Atlantic States, 3 to 10; South Atlantic States, 5 to 8; Eastern Gulf States, 4 to 11; Western Gulf States, 5 to 12; Indian Territory, Arkansas, Tennessee, and the Ohio Valley, 4 to 9; Lower Lake region, 3 to 14; Upper Lake region, 3 to 10; Northwest, 3 to 8; Rocky Mountain stations, 5 to 12; California coast, 1 to 7 days.

Droughts.—Belvidere, Ill., dryest month in ten years. Waltham, Mass., drought has prevailed. Shelburne, N. H., springs low, 13th. South Hartford, N. Y., streams and fountains low during month, but beginning to rise at close. Ruggles, Ohio, a very dry month. Ringgold, Ohio, smallest rain-fall ever recorded in February. Woodstock, Vt., drought still continues; wells and springs dry. Snowville, Va., month dry and water low. Wytheville, Va., on 22d a drought, no rain having fallen for over a month.

RELATIVE HUMIDITY.

The average relative humidity for the month, as reported from the Signal-Service stations, ranges as follows: In New England, 65 to 78 per cent.; Middle Atlantic States, 52 to 66; New Jersey and North Carolina coast stations, 70 to 76; South Atlantic States, 60 to 69; Gulf States, 64 to 76; Indian Territory, Arkansas, Tennessee, and the Ohio Valley, 59 to 70; Lower Lake region, 65 to 73; Upper Lake region, 66 to 75; Missouri and Upper Mississippi Valleys, 63 to 73; Valley of the Red River of the North, 67 to 83; Rocky Mountain stations, 53 to 75; California coast, 70 to 74; Key West, 80; Mount Washington, 85.

WINDS.

Prevailing winds.—These are shown upon Chart No. II, the arrows flying with the wind. At Virginia City they were from the SE. The maximum hourly velocities have been given in the description of the movements of high and low pressure areas, with the dates upon which they have occurred.

Total movements of the air.—The following are the largest total movements, as recorded at the Signal-Service stations: Cape May, 11,114 miles; Thatcher's Island, 10,828; Sandy Hook, 10,530; Kittyhawk, 10,348; Pike's Peak, 9,376; Cape Lookout, 9,308; Cape Hatteras, 9,305; Barnegat, 8,530; Cape Henry, 8,454. The smallest movements have occurred at the following stations: Virginia City, 1,796 miles; Dubuque, 1,943; Salt Lake City, 2,411; Vicksburg, 2,464; Lynchburg, 2,484; Nashville, 2,497; Augusta, 2,550; Baltimore, 2,841; Shreveport, 2,865; Denver, 2,997.

VERIFICATIONS.

Indications.—As worked up three times daily, and issued to the public at 1 a. m. and 7.30 p. m., they have been carefully compared with the actual conditions during the succeeding twenty-four hours, and the following result obtained, viz: the percentage verified averages 83.8 for New England; 82.0, Middle States; 85.6, South Atlantic States; 82.2, Eastern Gulf States; 82.9, Western Gulf States; 82.1, Tennessee and the Ohio Valley; 84.6, Lower Lake region; 89.3, Upper Lake region; 84.9, Upper Mississippi Valley; 84.5, Lower Missouri Valley. For the whole country the average verified is 84.2 per cent. By elements the percentage verified averages 88.1 for the weather; 84.1, wind-direction; 80.6, temperature; 83.0, barometric changes. There were 14 omissions to predict (11 for temperature and 3 for barometer) out of 3,360, or 0.42 per cent.

Cautionary signals.—Grand Haven and Milwaukee are the only lake stations at which signals were displayed, owing to the suspension of navigation. Out of 127 signals ordered to be hoisted along Lake Michigan, the Gulf and Atlantic coasts, 106 were re-

ported justified, but 25 of these were late; 21 not justified; 11 lowered too soon, especially on the morning of the 18th, along the New Jersey and New England coasts; 9 kept up too long. From scattered stations, excepting on the 12th and 18th, 36 cases are reported in which the hourly wind-velocity reached 25 miles and over without the display of signals.

NAVIGATION.

Upon Chart No. III is a table giving the highest and lowest water-marks, with the dates upon which they occurred. The Red River rose slowly throughout the month. Missouri: at Yankton the ice pased out on the 21st; Omaha, ice broke up on 21st; Plattsmouth, Nebr., commenced breaking up, but gorged 10th, melting and floating away 17th; Leavenworth, breaking up 8th, gorged 9th, opened 12th. Mississippi: at Saint Paul the ice disappeared below bridge on the 27th; La Crosse, opened 27th; Dubuque, ferry opened 17th, ice drifting 25th, open earlier than usual; Davenport, ice moved out 21st; Muscatine, 19th; Fort Madison, 17th; Keokuk, channel clear 18th; Saint Louis, ice broke up 1st, heavy floating ice 5th, navigation resumed 6th; Chester, Ill., gorge broke 4th, opening navigation below Saint Louis; Cairo, a steady decline of 14 feet 3 inches to the 6th, rise of 4 feet 1 inch to 13th, then falling to close; below the changes were not important. Cumberland: at Nashville, rose 1 foot 1 inch to 8th, then slowly falling to end. Tennessee: changes unimportant, with a slight decline. Ohio: at Pittsburgh there was a sudden rise of nearly 8 feet on the 3d, gradual decline to the 22d, then a rise of 1 foot 2 inches to 26th; Cincinnati, a rise of nearly 14 feet from 2d to 8th, then falling to close; Louisville, rose 3 feet from 2d to 9th, after which the decline was continuous. Savannah: at Augusta, a sudden rise of 13 feet 7 inches occurred on the 5th, slowly fell to the 16th, and oscillated a few inches daily to end of month. Ice broke up 3d, at Cleveland, on Cuyahoga River. Northport, Mich., harbor clear of ice 6th. Salem, N. J., navigation opened 8th. Flushing Bay, N. Y., clear of ice 22d. Hudson River: navigation resumed on 28th at Wappinger's Falls and West Point. Narragansett Bay open at Fall River, Mass., 1st. New Bedford, Mass., harbor clear below bridge 15th.

TEMPERATURE OF WATER.

As heretofore, the maximum and minimum temperatures, with the average depth of the water, are given in the table on Chart No. II.

ATMOSPHERIC ELECTRICITY.

Thunder-storms.—1st, Martinsville, Ill., Baxter Springs, Kans., Indianapolis, Ind., 7th, Daytona, Fla., Indianola, Tex. 9th, Gainesville, Ga., Murphey, N. C., Saint Mark's, Fla. 11th, Austin, Tex. 15th, Brownsville, Tex. 16th, Cape Hatteras, N. C. 19th, Aiken, S. C. 20th, Tybee Island, Ga. 22d, Monterey County, Cal. 23d, Milford, Del., Salem and Cape May, N. J., Capeville, and Hampton, Va. 24th, Fort Craig, N. M. 25th, Monterey County, Cal. 27th, Austin, Tex. 28th, New Ulm, Austin, Boerne, and Indianola, Tex.

Distant lightning.—1st, Decatur, Ill. 9th, Tybee Island and Forsyth, Ga. 10th, Cape Hatteras. 17th, Golden, Col. 19th, Atlanta, Ga., with heavy rain. 23d, Atlantic City, N. J. 28th, New Orleans.

Auroras.—1st, Geneseo, Ill., Pembina; 2d, Geneseo, Ill., Independence and Cresco, Iowa, Duluth; 3d, Nora Springs, Iowa, Escanaba, Pembina; 4th, Escanaba; 8th, Duluth; 9th, Manitowoc, Wis., Rochester; 10th, Waltham, Mass., Duluth, Rochester; 11th, Duluth, Eastport, Pembina; 12th, Cornish and Gardiner, Me.; 13th and 15th, Gardiner, Me.; 16th, Monticello and Davenport, Iowa, Contoocookville, N. H.; 17th, Waltham and Cambridge, Mass., Davenport, Pembina; 20th, Waltham, Mass., Pembina; 24th, Fort Brady, Mich.; 28th, Boonsborough, Iowa.

OPTICAL PHENOMENA.

Solar halos.—1st, Indiana, Iowa, Kansas, Michigan, Nebraska, New Hampshire, New York, Wisconsin; 2d, Georgia, Illinois, Massachusetts, New Hampshire, New York, Rhode Island, South Carolina; 5th, Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York; 6th, Alabama, Louisiana, Mississippi, South Carolina; 7th, District of Columbia, Illinois, Iowa, North Carolina, Tennessee, Virginia, West Virginia; 8th, Alabama, Illinois, Minnesota, New York, North Carolina, South Carolina, Tennessee; 9th, New York, North Carolina, Tennessee; 10th, Colorado, Kansas, Minnesota, South Carolina, Tennessee; 11th, Dakota, Illinois, Indiana, Michigan, Minnesota, New York, Ohio; 12th, Connecticut, Dakota, Georgia, Illinois, Nebraska, Rhode Island, South Carolina; 13th, Illinois, Iowa, Wisconsin; 14th, Illinois, Maryland, Ohio, Pennsylvania; 15th, Indiana, Iowa, Maine, Nebraska, New Hampshire, New Mexico, Rhode Island; 16th, Maine, Missouri, Ohio; 17th, Ohio; 18th, Louisiana, Pennsylvania; 19th, Maine, New Hampshire, Ohio, South Carolina, Tennessee; 20th, District of

Columbia, Iowa, Michigan, New York, Tennessee, Texas; 21st, Tennessee; 22d, Georgia, Massachusetts, Michigan, New Hampshire, New Mexico, New York, Ohio, Pennsylvania, Vermont, Wisconsin; 23d, Georgia, Maine, New Hampshire, New Mexico, New York, Rhode Island, Vermont; 24th, Michigan, New Mexico; 25th, Kansas, Michigan, Wisconsin; 26th, Iowa, South Carolina; 27th, Dakota, Minnesota, Ohio, Tennessee; 28th, Colorado, Connecticut, Maine, New York, Tennessee, Virginia.

Lunar halos.—1st, Georgia, Kansas, New York, North Carolina, Ohio, Utah; 2d, Dakota, Kansas, Massachusetts, New Jersey, New York, North Carolina, Pennsylvania; 3d, Iowa; 4th, Michigan; 5th, New Hampshire, New York; 16th, Missouri, Nebraska; 17th, Louisiana, Tennessee, Texas; 18th, Alabama, Connecticut, Florida, New York, Tennessee, Texas; 19th, New York, Florida, Dakota; 20th, Dakota, Kansas, Maine, Maryland, Massachusetts, New Jersey, New Mexico, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Texas, Virginia, West Virginia; 21st, Alabama, California, Florida, Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Mississippi, Missouri, New Hampshire, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Vermont; 22d, California, Connecticut, District of Columbia, Florida, Maryland, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Pennsylvania, Texas, Utah, Vermont, Virginia, West Virginia, Wisconsin; 23d, Alabama, Colorado, Louisiana, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Texas, Wyoming; 24th, Colorado, Florida, Georgia, Indiana, Kansas, Louisiana, Michigan, Mississippi, Missouri, Nebraska, New Jersey, New York, North Carolina, Texas, Utah, Wisconsin, Wyoming; 25th, Alabama, Florida, Illinois, Indiana, Kansas, Louisiana, Michigan, Minnesota, Missouri, New Jersey, New York, North Carolina, Ohio, Tennessee, Texas, Wisconsin; 26th, Alabama, Florida, Illinois, Iowa, Kansas, Minnesota, Missouri, New Jersey, New Mexico, North Carolina, Ohio, Tennessee, Texas, Vermont; 27th, Indiana, Mississippi, Missouri, New York, North Carolina, Ohio, Tennessee, Vermont; 28th, Illinois, Indiana, Iowa, Kentucky, Missouri, North Carolina, Ohio, Tennessee, Vermont.

Mirage.—Geneva, Nebr., 1st; Ellinwood, Kan., 1st, 2d, 3d, 4th, 5th, 6th; Dodge City, 17th; Breckenridge, Minn., 2d, 9th, 12th, 24th, 25th, 26th, 27th; Moorhead, Minn., 2d, 5th, 6th, 7th, 8th, 12th, 27th, 28th; Duluth, Minn., 17th; Tybee Island, Ga., 18th, 25th; New Bedford, Mass., 20th.

MISCELLANEOUS PHENOMENA.

Zoological. (1) *Birds.*—*Wild geese* were observed at Hennepin, Ill., flying south, 1st; Decatur, Ill., north, 8th; Belvidere, Ill., east, 8th; Oregon, Mo., 1st; Emerson, Nebr., southeast, 1st and 3d; Plattsmouth, Nebr., southwest, 2d; Clear Creek, Nebr., north, 5th, 6th, 7th, 8th, and 26th; Fort Madison, Iowa, north, 1st, 2d, and 6th; Muscatine, Iowa, 2d; Boonsborough, Iowa, southwest, 5th, north, 17th; Nora Springs, Iowa, south, 10th; Rockford, Iowa, north, 10th and 15th; Davenport, south, 20th; Monticello, Iowa, northwest, 21st, north, 22d; Vail, Iowa, south, 22d, north, 25th; Council Grove, Kans., north, 2d; Creswell, Kans., north, 5th; Bellefontaine and Carthagena, Ohio, north, 4th; Flushing, N. Y., north, 5th; Starkey, N. Y., 28th; Fort Macon, N. C., south, 7th, 10th, 15th, and north, 18th; Galveston, north, 8th; Melissa, Tex., west, 10th; Bloomfield, Wis., north, 10th; Accotink, Va., north, 21st; Fall River, Mass., north, 2d; Jackson, Tenn., north, 23d and 28th; Santa Fé, N. Mex., north, 23d; Fort Gibson, north, 24th; Breckenridge, north, 26th. *Wild ducks*, at Milford, Ind., 1st; Louisville, Ill., north, 2d; Decatur, Ill., north, 8th; Dodge City, 4th; Golden, Colo., north, 6th; Vail and Monticello, Iowa, north, 7th; Rockford, Iowa, north, 15th; Guttenberg, Iowa, 23d; Bloomfield, Wis., north, 10th; Emerson, Nebr., north, 14th; Carthagena, Ohio, north, 14th; Corsicana, north, 17th; Plattsmouth, Nebr., north, 24th and 26th; Creswell, Kans., west, 19th. *Robins*, Oregon, Mo., 1st; Bethel, and Bellefontaine, Ohio, 2d; Vevay, Ind., Plattsmouth, Nebr., and Melissa, Tex., 3d; Brownsville, Pa., and Salem, W. Va., 4th; Ringgold, Ohio, 10th; Merom, Ind., 12th; Jacksonburg, Ohio, 19th; Tabor, Iowa, 20th; Owing's Mills, Md., and New London, Conn., 22d; Baxter Springs, Kans., and Urbana, Ohio, 24th; Accotink, Va., 25th; Havana, Ill., and Bridgetown, Va., 26th; New Bedford, Mass., 28th. *Phœbebirds*, Waltham, Mass., 2d; Somerset, Mass., 4th. *Bluejays*, Monticello, Iowa, 5th; Jackson, Tenn., 12th. *Killdeer*, Melissa, Tex., 12th; Fort Madison, Iowa, 25th; Baxter Springs, Kans., 18th. *Sparrows*, Monticello, Iowa, 6th; Embarrass, Wis., 16th; Wanpaca, Wis., 26th. *Meadow-larks*, Kenton, Ohio, 12th. *Mockingbirds*, Macon, Ga., 6th; Melissa, Tex., 12th. *Redbirds*, Jackson, Tenn., 6th; Louisville, Ill., 10th; Melissa, Tex., 12th; Urbana, Ohio, 17th. Blackbirds, Louisville, Ill., 10th; Sedgwick, Kans., 26th. *Woodpeckers*, Decatur, Ill., 8th; Louisville, Ill., 10th. *Bluebirds*, Fort Madison, Iowa, 1st; Bethel, Ohio, 2d; Plattsmouth, Nebr, and Mellisa, Tex., 3d; Fall River, Mass., and Brownsville, Pa., 4th; West Chester, Pa., 5th and 10th; Decatur, Ill., 7th; Macon, Ga., 9th; Louisville, Ill, 10th; Vevay, Ind., Muscatine, Iowa, and Northport, Mich., 11th; Wappinger's Falls, N. Y., 12th; Havana, Ill., 13th; Adrian, Mich., and Jacksonsburg, Ohio, 18th; New Bedford and Meadon, Mass., Oregon, Pa., New London, Conn., and Milford, Ind., 22d; Accotink, Va., 27th; Detroit, 28th. (2)

Insects.—Grasshoppers, at Vail, Iowa, eggs turned up in plowing, sound and healthy. Tabor, Iowa, ground filled with eggs. Burlingame, Kans., some hoppers hatched out. Breckenridge, Minn., hatching out, 8th. Davenport, Iowa, reported hatching out in western part of State, 8th. Kansas City, Mo., 9th, in Southern Kansas the warm weather of the past ten days has hatched out millions of grasshoppers. Des Moines, Iowa, 7th, the present warm weather has brought millions of grasshoppers to the surface. Plattsmouth, Nebr., hatching out in favorable exposures 6th; on the 17th the ground from the surface to a depth of one or two inches was literally full of them. (3) *Frogs* heard at Howard, Nebr., 18th. Cleveland, Tenn., 4th. At Okahumpka, Fla., on the 28th, the ground was covered with small toads.

Botanical.—(1) *Trees.—Peach trees* in bloom at Macon, Ga., 20th; New Orleans, 10th; Welborn, Fla., 16th; Aiken, S. C., 20th. *Orange trees* budding at Welborn, Fla., 17th. *Plum trees* in bloom at New Orleans, 13th; Welborn, Fla., 12th; Aiken, S. C., 12th. *Apricot trees* in bloom at Lynchburg, Va., 28th. (2) *Vegetables.*—Cloverdale, Cal., vegetables plenty; Weldon, Fla., 24th, early corn up, garden pease plenty.

Meteors.—1st, Bennettsville, Ky., Corning and Oregon, Mo., Waterburg, N. Y. 2d, Fall River, Mass., Corning, Mo., Jacksonborough, Ohio. 3d, Monticello, Iowa, Woodstock, Md., Emerson, Nebr. 5th, Vevay, Ind. 8th, Corning, Mo., Westerville and Carthagena, Ohio. 9th, Corning, Mo., Cincinnati, Ohio, Ephrata, Pa. 17th, Contoocookville, N. H., Tybee Island, Ga. 18th, West Charlotte, Vt. 20th, Smithville, N. C. 21st, Westborough and Waltham, Mass., Trenton, N. J., New London and New Haven, Conn. 22d Waterburg, N. Y. 23d, New Ulm, Tex. 26th, Flushing, N. Y. 28th, Daytona, Fla., Trenton, N. J.

Earthquakes.—A light shock was felt at Portland, Me., at 2.30 p. m. of the 18th; a heavy shock at Quincy, Plumas County, Cal., 17th.

A shower of stones is reported to have fallen on the 16th in Social Circle, Walton County, Ga., varying in size from a hen's egg to that of a man's two fists, irregular in shape, dark grayish color, interspersed with a bright, shiny substance resembling mica. The shower was brief, extended over about four acres of ground, and followed an explosive sound.

Polar bands.—Georgia, Tybee Island, 8th. Iowa, Guttenberg, 1st, 7th, 8th, and 12th. Tabor, 28th. Kentucky, Bennettsville, 6th and 27th. Maine, Gardiner, 15th, 27th, and 28th. New Hampshire, Contoocookville, 5th. Ohio, Carthagena, 1st, 7th, 11th, 13th, 14th, and 20th; Cincinnati, 19th. Virginia, Wytheville, 3d, 6th, 7th, 12th, 13th, 20th, and 26th. Minnesota, Duluth, 25th. Wisconsin, Milwaukee, 20th. Mississippi, Vicksburg, 28th.

Prairie and forest fires.—At Dodge City, Kans., 2d; Oregon, Mo., 3d; Wytheville, Va., 11th; Salem, West Va., 12th, 15th, and 21st; Monticello, Iowa, 17th.

Zodiacal light.—Arkansas, Monticello, 11th, 16th, and 18th. Illinois, Carbondale, 9th. Iowa, Monticello, 2d, 3d, and 8th to 15th; Iowa City, frequently, especially 2d, 10th, and 13th. Kansas, Ellinwood, 2d, 3d and 4th. Maryland, Emmittsburg, 10th; Sandy Springs, first noticed 5th and continued for two weeks. Massachusetts, Somerset, 4th, 6th, 8th, 10th, 11th, 13th, and 14th; Westborough, 9th, 10th, and 11th; Cambridge, 6th, 8th, 9th, 11th, 15th, and 16th. Michigan, Adrian, 3d, 7th, 8th, 10th, 12th, 13th, and 28th. Missouri, Corning, 1st, 2d, 3d, 10th, and 12th. Oregon, 1st, 3d, 6th, 9th, 10th, 11th, 12th, and 17th. Nebraska, Clear Creek, 1st, 3d, 5th, 6th, 8th, 9th, and 10th. New Hampshire, Contoocookville, 14th. New Jersey, Trenton, 7th and 14th; Freehold, 6th, 9th, 11th, and 13th; Atco, 7th, 8th, 9th, 10th, 11th, 13th, and 14th. New York, Waterburg, 4th, 5th, 6th, 8th, 9th and 14th; Malone, 14th. Ohio, Bellefontaine, 2d, 3d, 6th, 7th, 8th, 9th to 14th, and 16th; Urbana, 2d, 4th, 9th, 12th, 14th, and 15; Carthagena, 4th, 6th, 7th, 8th, 9th, 10th, and 12th. Virginia, Wytheville, 1st, 10th, 12th, 15th, and 28th.

Published by order of the Secretary of War.

ALBERT J. MYER,
Brig. Gen. (Brevet Assigned), Chief-Signal Officer, U. S. A.

PAPER 34.

MONTHLY WEATHER REVIEW, MARCH, 1877.

INTRODUCTION.

The present review for the month of March depends upon all data received from United States and Canadian stations up to the 14th of April. The most noticeable features recorded during March are, the very severe storm No. X, and its unusually slow movement along the Atlantic coast; the heavy rains and snows of the Ohio Valley Lower Lakes and Atlantic States; the freshets in the rivers of the Middle and Eastern States; the aurora of the 9th.

BAROMETRIC PRESSURE.

In general.—The general distribution of atmospheric pressure is shown by the isobars upon Chart No. II, from which we see that the area of mean highest pressure extends from Florida and South Carolina, westward, to Texas and Kansas. The lowest mean pressure is at the mouth of the Saint Lawrence. This distribution agrees with that of March, 1874, but is the reverse of that of March, 1875, '76. The temperatures during the subsequent April of those years were, in 1874, much below the average, and in 1875 somewhat below; but April, 1876, was colder east of the Alleghanies and warmer to the westward.

Barometric range.—The greatest barometric ranges have been as follows: 1.51 inches at Malone; 1.49 at Baltimore; 1.48 at Oswego; 1.46 at Philadelphia and Washington. The least ranges have been: San Diego, 0.35; Key West, 0.43; San Francisco, 0.53; Punta Rassa, 0.57; 0.64 at Cheyenne and Indianola; 0.65 at Galveston; 0.73 at Pike's Peak; 0.75 at Salt Lake City. The general range of the barometer for the whole country is best seen by the following table, which gives the maximum and minimum readings at the centers of the respective areas of high and low pressures.

Area. No.	Maximum barometer in high areas.	Minimum barometer in low areas.	Area. No.	Maximum barometer in high areas.	Minimum barometer in low areas.
I	30.34	29.07	VII	30.39	29.35
II	30.28	29.52	VIII	30.50	29.75
III	30.15	29.59	IX	30.37	29.54
IV	30.45	29.00	X	30.14	29.02
V	30.61	29.76	XI	30.64	29.62
VI	30.48	29.15	XII	30.46	29.20

Areas of high pressure.—The areas of high barometer have not been remarkable either for geographical extent or high central pressure. A very considerable amount of cold air has existed north of our stations, and to its somewhat unusual extent southward seems to be attributable the large number of storms that have pursued their courses eastward over the Ohio Valley.

In detail, the areas of high pressure were as follows:

No. I. Central on the 1st, at 7.35 a. m., in Virginia, and continued stretching along the Atlantic coast during the 2d.

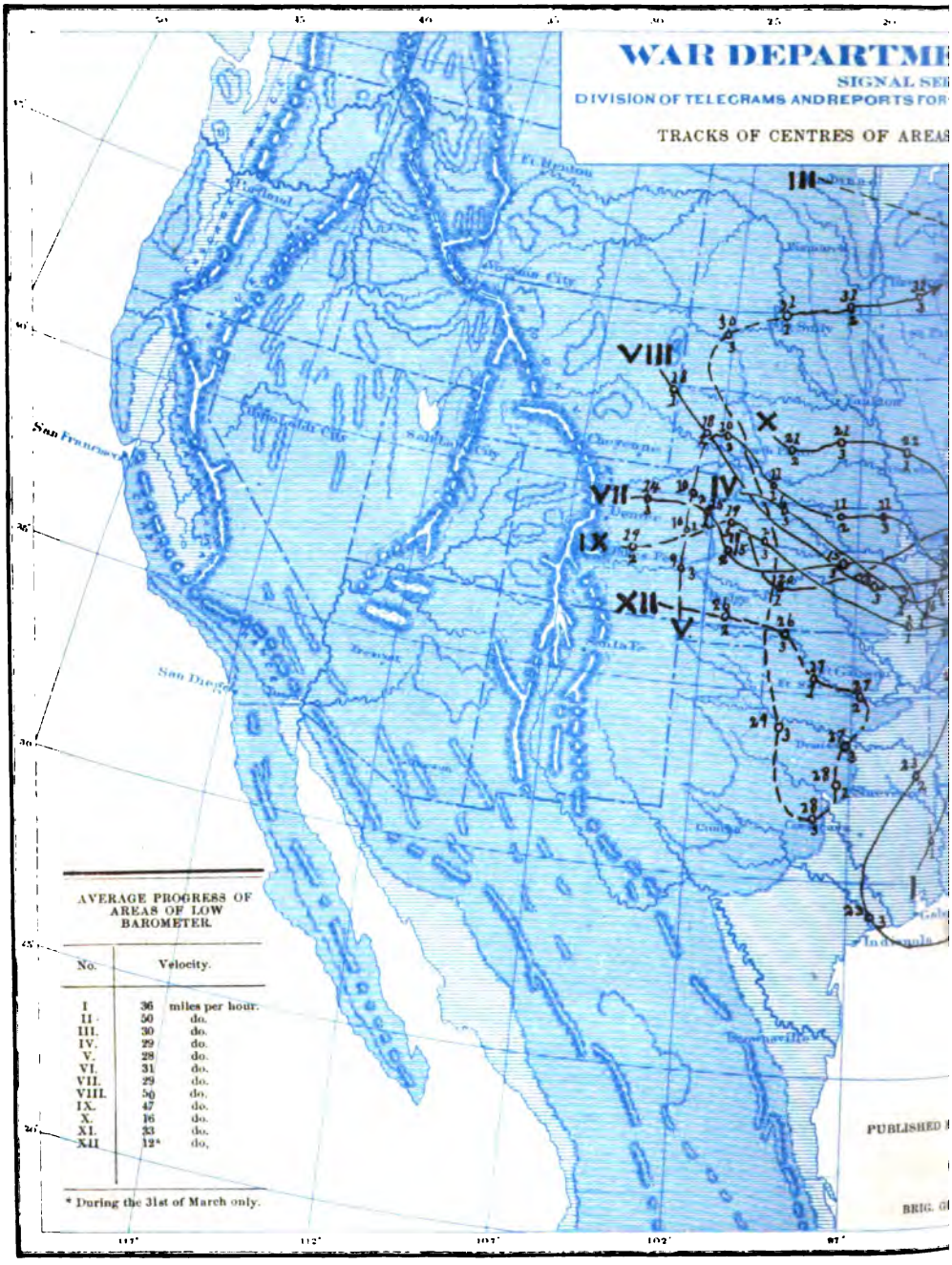
No. II represents an accumulation of air along the east Atlantic coast, due to the indraught from the eastward, attending low barometer No. I, which was then over the Lake region.

No. III originated in the southerly winds drawn northward over the Southern States on the 2d and 3d, while low barometer No. II was developing in Missouri.

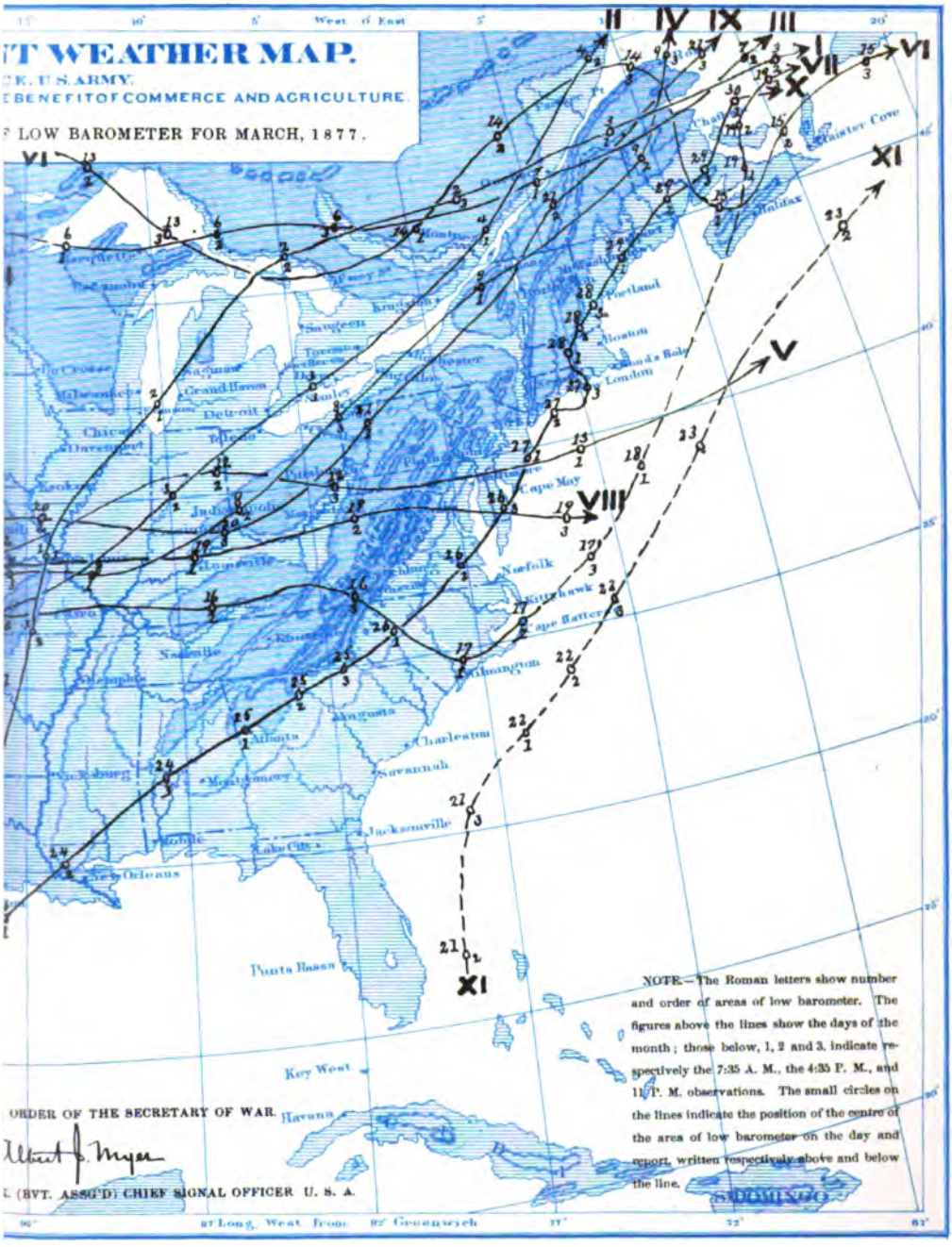
No. IV is the high barometer that followed low No. II. It extended from the Pacific coast, eastward, over the greater portion of the Southwest, and was central in Arkansas at 7.35 a. m. of the 4th. Its boundary continued extending eastward, while the central highest pressures were, at 7.35 a. m. of the 5th, still in the Missouri Valley; by this time, also, pressures had begun to fall, with rain, in Oregon. By 7.35 a. m. of the 6th, low barometer No. III had become developed to the northward, and high, No. IV, was central over Louisiana and Tennessee. During the next twenty-four hours it advanced to the South Atlantic coast and there remained.

No. V extended on the 7th, at 7.35 a. m., eastward, along the northern border of the Lake region and the Northwest. Its eastern portion subsequently passed southeastward over New England and the Canadian Provinces. Its western portion continued over Manitoba and the Northwest, gradually extending southward, until, at 7.35 a. m. of the 9th, the highest pressure was over Nebraska and Northern Texas. During this interval low barometer No. IV had acquired its remarkable extension. The area of highest pressure now advanced eastward, and was, on the 10th, at 7.35 a. m., over Tennessee, and on the 11th, at 7.35 a. m., over Virginia. The pressure remained high throughout the Atlantic States during the 11th, while low barometer No. V was developing west of the Mississippi.

No. VI appears on the 13th, at 7.35 a. m., between the low barometers, Nos. V and VI, as a ridge of high pressure, extending from the Southwest to the mouth of the Saint Lawrence. The northern portion of this area moved eastward over the Gulf of Saint Lawrence. The southern portion continued in the West Gulf States, being central, at 7.35 a. m. of the 14th, in Louisiana, after which it became merged into high, No. VII.


WAR DEPARTME
SIGNAL SE
DIVISION OF TELEGRAMS AND REPORTS FOR
TRACKS OF CENTRES OF AREAS
III
VIII
X
VII
IV
IX
XII
V
I
San Francisco
San Diego
Salt Lake City
Denver
Santa Fe
Ft. Benton
Virginia
Omaha
Cheyenne
Indianola
Brownsville
Corpus Christi
PUBLISHED
BRIG. G
AVERAGE PROGRESS OF AREAS OF LOW BAROMETER.
No. | Velocity.
I. 36 miles per hour.
II. 50 do.
III. 30 do.
IV. 29 do.
V. 28 do.
VI. 31 do.
VII. 29 do.
VIII. 50 do.
IX. 47 do.
X. 16 do.
XI. 33 do.
XII. 12* do.
* During the 31st of March only.

No. I.


T WEATHER MAP.
E. U.S. ARMY.
BENEFIT OF COMMERCE AND AGRICULTURE.
LOW BAROMETER FOR MARCH, 1877.
VI
II
IV
IX
III
VII
X
I
VI
XI
V
VIII
XI
Portland
Boston
Cape May
Norfolk
Kitty Hawk
Cape Hatteras
Charleston
Savannah
Jacksonville
Punta Rassa
Key West
Havana
ORDER OF THE SECRETARY OF WAR.
(BVT. ASS'T) CHIEF SIGNAL OFFICER U. S. A.
NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:35 A. M., the 4:35 P. M., and 11 P. M. observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.
87 Long. West from 82° Greenwich

No. VII had its origin in the in-draught of cold air from the Northwest, following low, No. VI. It was central at 7.35 a. m. of the 14th, in Dakota, whence it rapidly moved down the Missouri Valley, and was, at 7.35 a. m. of the 15th, central near Cairo, and by 7.35 a. m. of the 16th had spread over the South Atlantic States.

No. VIII followed in the rear of low barometer No. VII, and was, at 7.35 a. m. of the 16th, central in Manitoba; but at 7.35 a. m. of the 17th, central as a ridge extending from Lake Huron to Kansas. During the next twenty-four hours this ridge assumed larger proportions, and, at 7.35 a. m. of the 18th, covered the Gulf States and Saint Lawrence Valley, the pressure being highest at the southwestern extremity. During the next twenty-four hours its southern portion extended eastward over the Atlantic States, and remained until the 19th.

No. IX appears first, at 11 p. m. of the 19th, central over the Lake region, whence it moved southeastward to the Middle Atlantic coast.

No. X had its origin in the northerly winds that prevailed on the 20th, west of the Mississippi, in the rear of low, No. IX. It was central at 7.35 a. m. of the 21st, in Indian Territory, and moved thence eastward, until, at 7.35 a. m. of the 22d, it extended as a ridge from Louisiana to West Virginia, separating low barometers No. X and XI. After this the highest pressure diminished, while the isobars retreated southward, and, at 7.35 a. m. of the 23d, only a comparatively slight elevation was central in the Eastern Gulf States.

No. XI. While the barometric trough, No. X, was, on the 23d, over the Ohio Valley and the Southwest, the pressure rapidly increased to the northward with cold northeast winds; and on the 24th, at 7.35 a. m., the area of highest pressure extended over Dakota and Lake Superior. The barometer, during the rest of the day, rose very rapidly at the Canadian stations, and especially over the Gulf of Saint Lawrence, but fell west of the Upper Mississippi, so that, at 7.35 a. m. of the 25th, the highest pressure was north of New Brunswick, and, at 7.35 a. m. of the 26th, east of Cape Breton, where it continued high until the morning of the 27th, preceding low barometer No. X.

No. XII. This area of high pressure originated in the northerly winds following low barometer No. X. It was apparently central in Manitoba at 7.35 a. m. of the 27th, whence it extended rapidly southward and slowly eastward. At 7.35 a. m. of 29th, was central over Lake Superior; at 7.35 a. m. of 30th, over Lake Huron, and at 7.35 a. m. of 31st, off the Middle Atlantic coast.

Areas of low pressure, in general.—These have, during March, presented several interesting features. Of the twelve tracks charted on map No. I, one, No. XI, lies entirely to the east of the Atlantic coast; two, Nos. III and VI, lie on the northern border of our stations; of the remaining nine, some were preceded by depressions on the Pacific coast; but, in general, they may be said to have begun on the east slope of the Rocky Mountains, and, after extending slowly southward into Kansas, or even into Texas, moved northeast generally over Missouri and Indiana to the Gulf of Saint Lawrence.

Areas of low pressure, in detail.—No. I was central in Eastern Texas on the morning of the 1st, while a very general depression extended thence northward into British America, with southeast winds and cloudy followed by rainy weather. During the day the area of cloud and rain extended eastward to the Atlantic, and northward over the Lake region, while the barometer fell rapidly from the South Atlantic and Middle States westward to the Pacific. The central lowest pressures were, on the 1st, 7.35 a. m., 28.70 inches; at 4.35 p. m., 29.55; 11 p. m., 29.40; on the 2d, 7.35 a. m., 29.10; 4.35 p. m., 29.05, on which latter date the center was near Lake Huron, after which it passed more nearly eastward to the Gulf of Saint Lawrence, over which it appears to have been central on the afternoon of the 3d.

No. II. The cold northerly winds that prevailed from Dakota to Texas during the 2d were followed by rapidly falling barometer in Kansas, where winds shifted to southerly, and at 7.35 a. m. of the 3d the lowest pressure was central near the southeast corner of that State. During the remainder of this day the principal rain and snow fall took place over the Lake region, Middle and Eastern States, whence it extended southwestward into the Ohio Valley. The lowest pressure was, at 4.35 p. m., central in Indiana, and at 11 p. m. in Northern Ohio, but at 7.35 a. m. of the 4th extended from New York northward over the Saint Lawrence Valley, and 4.35 p. m. was near the mouth of that river. This depression seems to have remained over the Gulf of Saint Lawrence until the afternoon of the 5th.

No. III. The barometer fell steadily during the 5th in Manitoba and Oregon, while high barometer No. II was moving southeastward toward the Southern States. The lowest pressure passed over Fort Garry, Pembina, and Breckenridge after the 5th, 11 p. m., and was on the 6th, 7.35 a. m., central near Duluth. The depression extended southward and eastward until at 4.35 p. m. it had assumed a trough-like shape, whose axis stretched from Northern Texas over Mackinac into Canada, while rapidly rising barometer and cold northerly winds prevailed to the westward. These latter winds subsequently divided the trough into two portions, the southwestern one of which is described as storm No. IV. The northern division, or low barometer No. III, moved eastward over Canada, reaching the Saint Lawrence Valley at 7.35 a. m. of 7th, at

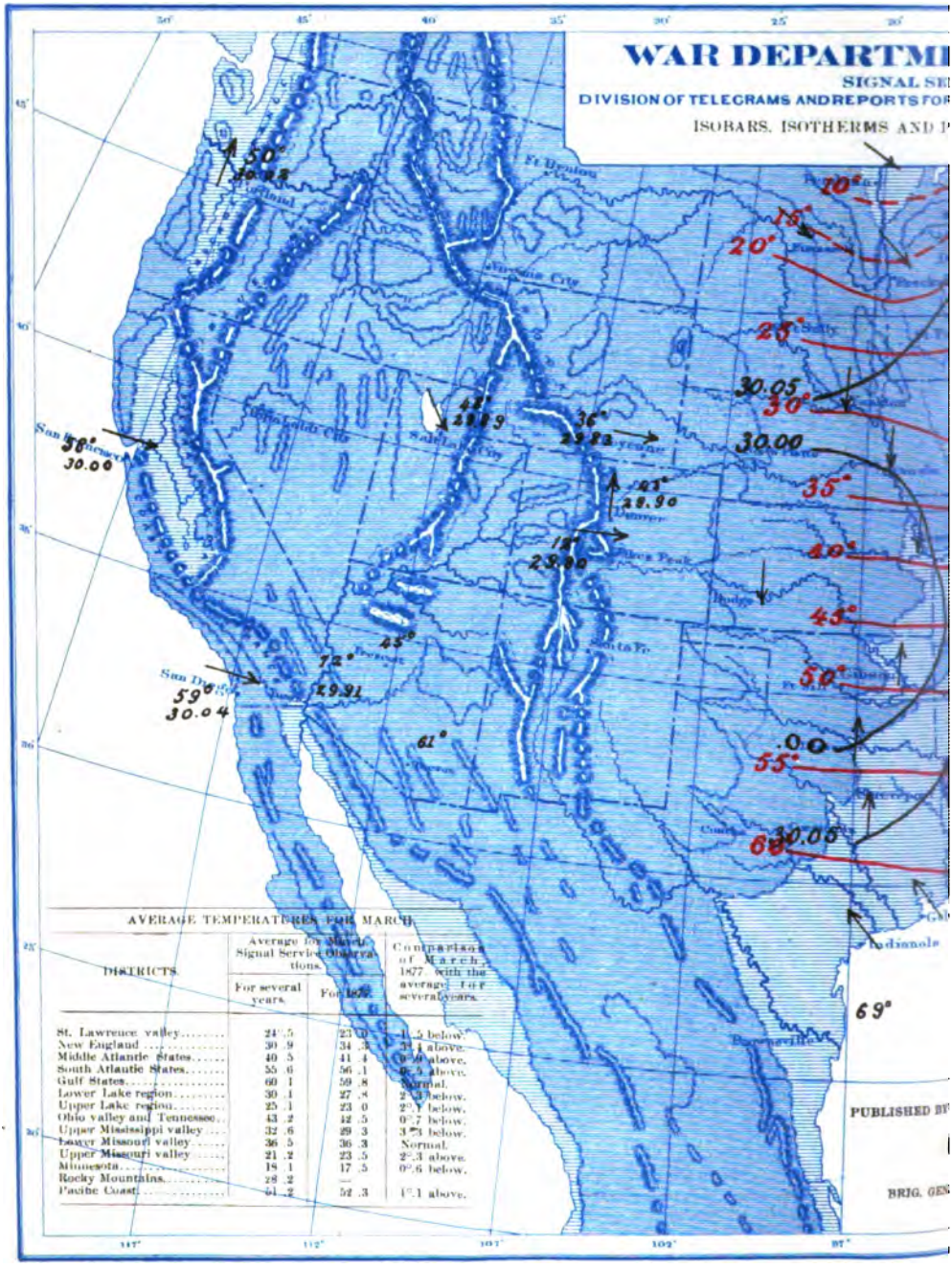
which time light snows were reported from a few stations in Northern New York and New England, and after this it disappeared over the Gulf of Saint Lawrence.

No. IV. This storm, which originated at the southwestern end of the trough mentioned in the preceding section, was on the 6th, at 4.35 p. m., central in Indian Territory, where cold northerly winds were at that time beginning to encounter the warm southerly winds of the Western Gulf States. The area of cloud and rain very rapidly extended northward, being at 11 p. m. of the 6th on the southern coast of Texas, but at 7.35 a. m. of 7th covering the whole country west of Lake Superior, Ohio, and Mississippi. By 11 p. m. of 7th the lowest pressure had moved northeastward into Missouri, while rain and snow prevailed over the Lake region, Northwest, and Southwest. At 7.35 a. m. of 8th, the lowest isobar, 29.50, constituted an ellipse, whose longest axis stretched from Arkansas to Indiana, measuring about five hundred miles, and shortest about one hundred miles. During the rest of the 8th, the pressure fell throughout the Northwest, Lake region and Atlantic States, but rose at the Southwest and Rocky Mountain stations, and the lowest barometer moved into Central Ohio, where at 4.35 p. m. of 8th the lowest pressure was 29.15 inches, as compared with 29.45 at the center in the morning. High winds were now very generally reported from the Atlantic coast, and a "norther" prevailed in the Western Gulf. At 11 p. m. of 8th, the lowest pressure was 29.05 inches, central on the boundary between Pennsylvania and Ohio, and at 7.35 a. m. of 9th, the central pressure was less than 29.00 inches in Northern New York, with southerly gales along the Atlantic coast and high westerly winds over the Lower Lakes. During Friday, the storm-center continued its slow progress eastward, and was at 7.35 a. m. of 10th apparently over the Gulf of Saint Lawrence.

No. V. While high barometer No. V was extending southward over the Gulf States, in the rear of low pressure No. IV, a very general depression seems to have moved southeastward on the 9th over the Pacific coast and Rocky Mountain stations. The pressure was lowest in Oregon at 4.35 p. m., 10th, with rain, while slight depressions were also then central west of Missouri and north of Lake Superior. The latter region was at once covered by an extensive area of northerly winds, high pressure, and cold weather, so that at 4.35 p. m. of the 11th the western depression only remained, being then central in Kansas, where the barometer had fallen three-tenths of an inch in twenty-four hours. This depression, like its predecessor, developed as a very elongated ellipse, trending northeastward and southwestward, and moving slowly eastward over the Ohio Valley to Western Pennsylvania, where it was central at 11 p. m. of the 12th, whence, however, it passed eastward over the Alleghanies and was at 7.35 a. m. of the 13th central off the New Jersey coast. After this its path can no longer be followed on our maps, but was probably northeastward, bringing it near Cape Breton at 7.35 a. m. of the 14th.

No. VI. While the preceding storm was on the 12th in the Ohio Valley, the barometer fell quite low (29.71) at Portland, Oreg., with southerly winds and rain, and also began to fall rapidly in Manitoba, with southeast winds and rain or snow. At 7.35 a. m. of 13th the central lowest pressure apparently extended from Eastern Dakota northward into British America. It was at 4.35 p. m. near Lake Superior, with brisk and high northwest winds to the westward. After moving southeastward to Lake Huron the depression turned northeast down the Saint Lawrence Valley, and at 7.35 a. m. of 15th extended from Maine northward beyond our stations. At no time, thus far, had any but the southern edge of this depression been presented upon our weather-maps, and it is likely that the storm-center proper was somewhat to the north of the track given upon Chart No. I, but at 4.35 p. m. of 15th the southern end of the depression had developed into a separate storm-center, central southeast of Maine, with very rapidly falling barometer. This depression passed over the Gulf of Saint Lawrence during Thursday night, and was at 7.35 a. m. of 16th apparently central near Southern Newfoundland.

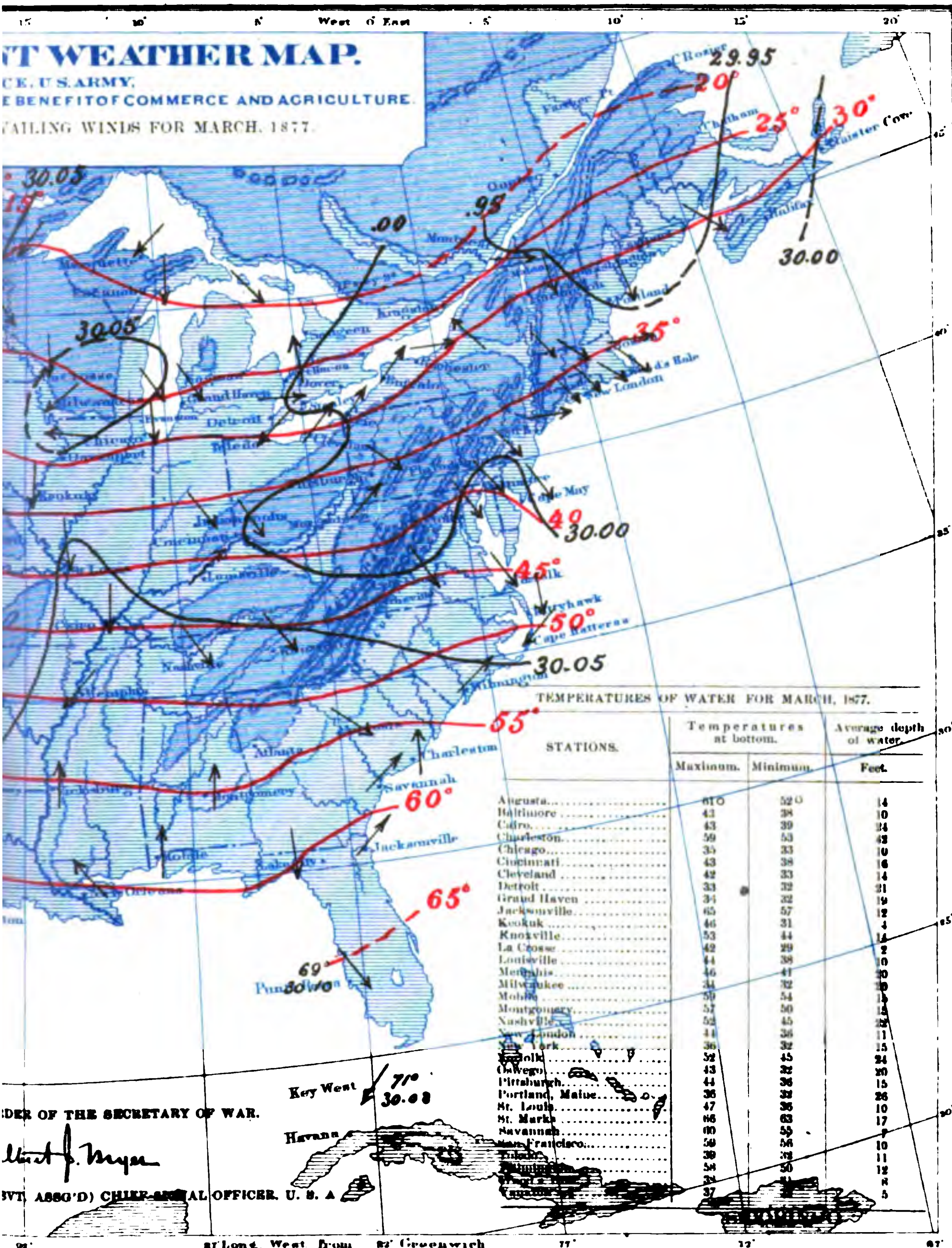
No. VII. The area of high barometer No. VII, central on the morning of the 15th near Cairo, was at that time already being followed by a decided barometric fall at the Rocky Mountain stations, from Montana to Texas, while the pressure continued high from Illinois to Wisconsin and eastward. During the rest of the 15th, currents of air seem to have set in from all directions toward Kansas, in the western portion of which State the central lowest pressure was developed. The storm-center moved thence southeastward to Southern Missouri, and thence eastward into Kentucky, where it was central at 4.35 p. m. of 16th, at which time the isobar of 29.70 extended from Texas northeastward to West Virginia, and a very extensive area of high pressure and cold northerly winds prevailed thence northward into the British possessions. A belt of very steep temperature gradients extended from Northern Texas to West Virginia, coinciding with the trough of barometric depression. These conditions moved slowly eastward to the opposite side of the Alleghanies during Friday night, while the central barometric pressure rapidly rose and was located in North Carolina at 7.35 a. m. of 17th; here the depression delayed, while the area of snow and rain extended both northward and southward, after which it advanced more rapidly northeastward to



AVERAGE TEMPERATURES FOR MARCH.

DISTRICTS.	Average for Signal Service Observations. For several years.	For 1877.	Comparison of March, 1877, with the average for several years.
St. Lawrence valley	24°.5	23°.0	1°.5 below.
New England	30 .9	34 .3	3°.4 above.
Middle Atlantic States	40 .5	41 .4	0°.9 above.
South Atlantic States	55 .6	56 .1	0°.5 above.
Gulf States	60 .1	59 .8	Normal.
Lower Lake region	30 .1	27 .8	2°.3 below.
Upper Lake region	25 .1	23 .0	2°.1 below.
Ohio valley and Tennessee	43 .2	42 .5	0°.7 below.
Upper Mississippi valley	32 .6	29 .3	3°.3 below.
Lower Missouri valley	36 .5	36 .3	Normal.
Upper Missouri valley	21 .2	23 .5	2°.3 above.
Minnesota	18 .1	17 .5	0°.6 below.
Rocky Mountains	28 .2	—	—
Pacific Coast	51 .2	52 .3	1°.1 above.

No. II.



TEMPERATURES OF WATER FOR MARCH, 1877.

STATIONS.	Temperatures at bottom.		Average depth of water.
	Maximum.	Minimum.	Feet.
Augusta	61	52	14
Baltimore	43	38	10
Cairo	43	39	24
Charleston	59	53	42
Chicago	35	33	10
Cincinnati	43	38	16
Cleveland	42	33	14
Detroit	33	32	21
Grand Haven	34	32	19
Jacksonville	65	57	12
Keokuk	46	31	4
Knoxville	53	44	14
La Crosse	42	29	2
Louisville	44	38	10
Memphis	46	41	20
Milwaukee	34	32	[illegible]
Mobile	59	54	[illegible]
Montgomery	57	50	[illegible]
Nashville	52	45	[illegible]
New London	44	36	11
New York	36	32	15
Norfolk	52	45	24
Oswego	43	32	20
Pittsburgh	44	36	15
Portland, Maine	36	32	26
St. Louis	47	36	10
St. Marks	66	63	17
Savannah	60	55	7
San Francisco	59	56	10
[illegible]	39	32	11
[illegible]	58	50	12
[illegible]	38	[illegible]	8
[illegible]	37	[illegible]	5

Nova Scotia, keeping always near the coast. This northeastward advance may, perhaps, be properly spoken of as the progressive closing up on its southern side of the barometric trough that, on the morning of the 17th, extended from Florida to Nova Scotia. In the course of its progress northeastward, the central depression gradually assumed a nearly circular form, and was at 4.35 p. m. of 18th in Nova Scotia, with a minimum barometer 29.55. After this the pressure rapidly diminished, being at 11 p. m. 29.35, and at 7.35 a. m. of 19th probably as low as 29.20 over the central portions of the Gulf of Saint Lawrence.

No. VIII. During the 17th the general trend of the isobars over the whole country east of the Rocky Mountains was northeastward and southwestward, and at 11 p. m. a ridge of high pressure, extending from Texas to the mouth of the Saint Lawrence, separated depression No. VII on the Atlantic coast from the slight depression that extended through Michigan, Indiana, Missouri, and Kansas, while a second area of high barometer appears in Minnesota and Manitoba. This latter extended eastward, but the barometer fell decidedly from Utah to Manitoba, and southward to Texas and Tennessee. Up to 4.35 p. m. of the 18th this depression seems to have extended irregularly from Indian Territory northwestward to Dakota, but at 11 p. m. was evidently central in Kansas, whence it moved rapidly eastward, and was at 7.35 a. m. of 19th in Illinois and Indiana, at 4.35 p. m. in West Virginia, and at 11 p. m. east of the Middle Atlantic coast.

No. IX. The very rapid eastward progress of No. VIII, on the 19th, was not followed by any decided recovery of pressure west of the Mississippi, but during the greater part of the day the pressure remained low in that region, and a belt of low pressure connected it with No. VIII. At 7.35 a. m. of 20th the area of falling barometer extended from Texas northward to Iowa and the Upper Lakes, while rapidly rising barometer and cold northwest winds prevailed from Colorado and Utah to Manitoba; the central depression No. IX is placed in Central Kansas at 7.35 a. m. of the 20th, and at 4.35 p. m. in Eastern Illinois, at which time the center of the State was crossed, from east to west, by a belt of very great temperature contrasts, followed about 6 p. m. by a series of local storms of the nature of small whirlwinds. At 11 p. m. the storm-center was in Southeastern Indiana, and at 7.35 a. m. of 21st in Western Pennsylvania, at 4.35 p. m. in the Saint Lawrence Valley, and at 11 p. m. had moved northeastward beyond our stations.

No. X. The very low barometer in Oregon, at 11 p. m. of the 20th, was followed by a decided fall during the 21st west of the Lower Mississippi and Lower Missouri Valleys, and at 4.35 p. m. a depression extended from Nebraska to Lake Superior and beyond, of which the western end developed into storm No. X. It was at 7.35 a. m. of 22d central in Iowa, and at 4.35 p. m., in Missouri. The central lowest pressure had, in the preceding twenty-four hours, fallen twenty-hundredths, and now extended as a very long oval from Southern Kansas to Northern Illinois, while the isobars west of the Alleghanies trended northeastward and southwestward even more decidedly than they had on the afternoon of the 16th. (See No. VII.) At 11 p. m. of 22d the lowest isobar, 29.70, constituted a remarkably long, sinuous trough, extending from Lake Huron to Indian Territory, a distance of eight hundred miles, with an average width of less than one hundred. This trough separated the two regions (Nos. X and XI) of high pressure, with corresponding warm southerly and cold northerly winds that were then central, respectively, over the East Gulf States and Manitoba. At 7.35 a. m. of 23d, these areas of high pressure had encroached upon the northeast end of the depression, and the barometer had so generally risen that the isobar of 29.80 covered scarcely one-fifth of its area at the previous report, and was confined principally to Northern Texas, Indian Territory, and Arkansas; meanwhile depression No. XI was advancing northward and rapidly developing off the Atlantic coast, and, at 4.35 p. m. of the 23d, the map presents three depressions central, respectively, in Northeastern Texas, West Virginia, and Nova Scotia, all which doubtless formed but a part of a trough extending farther than from Northern Mexico to Cape Breton. This depression was followed, as usual, by a speedy inflow of air from both the north and south, so that the 11 p. m. map, and still more that of 7.35 a. m. of 24th, shows areas of rising and high barometer over the Upper Lakes, Northwest and Southwest, and also over the South Atlantic States. The region of cloud and rain or snow at the latter date covered the Gulf States, Ohio Valley, and a large portion of the Lake region, Middle, and Eastern States. The area of low pressure No. X continued west of the Mississippi, and moved southward, keeping company with the advance of the southernmost point of the area of cold northerly winds until the latter reached the Gulf of Mexico after 11 p. m. of the 23d. In general, the barometric troughs mark the region in which an area of cold air is meeting and under running warmer air, and, accordingly, the eastward movement of low pressure No. X, during the rest of Friday night and early Saturday morning, marks the advance eastward along the West Gulf coast of the "severe norther" that began at Indianola at 12.35 a. m., Galveston 7.10 a. m., and New Orleans in the evening. By 11 p. m. of the 24th the lowest pressure, 29.80, had moved slightly northward into Western Alabama, and the area of warm southerly winds was confined to the South Atlantic and East Gulf States,

while cold northeast winds and steadily rising barometer extended from the Middle States and Lower Lakes northward over the Saint Lawrence Valley, where the pressure was then highest. By 4.35 p. m. of the 25th the central depression had diminished twenty-hundredths, and the attending winds and rains decidedly increased. The oval isobars had become more circular, and were central in Eastern Georgia. From this time on the progress of the storm-center, which had already been unusually slow, becomes the slowest of which we have any record over so long a period. It passed from Georgia steadily northeastward to the Gulf of Saint Lawrence, occupying six days in its passage. The central lowest pressures were, 25th, 4.35 p. m., 29.55, in northeastern Georgia; 26th, 4.35 p. m., 29.30, in Southeastern Virginia; 27th, 7.35 a. m., 29.30, in Eastern New Jersey; 27th, 4.35 p. m., 29.20, east of New Jersey; 28th, 4.35 p. m., 29.05, Southeastern Massachusetts; 29th, 4.35 p. m., 29.35, New Brunswick; 30th, 4.35 p. m., near Newfoundland; 31st, 4.35 p. m., east of Newfoundland. The brig George, from Maunabo, was in the center of the storm from 8 a. m. of the 27th to after 4 p. m. of the 28th, while waiting to round Montauk Point. The brig Maggie Glen encountered the storm-center on the 26th and 27th.

No. XI. The maps of the 21st show that a depression was during that day east of Florida, moving northward toward the South Atlantic coast. During the 22d the depression evidently passed northeastward very near Cape Hatteras. At 7.35 a. m. of 23d was off Cape Cod, at 4.35 p. m. was central in Nova Scotia, and by 11 p. m. had passed eastward beyond our stations. The brig George, from Maunabo to New London, encountered this storm on the 22d, when off the Carolina coast.

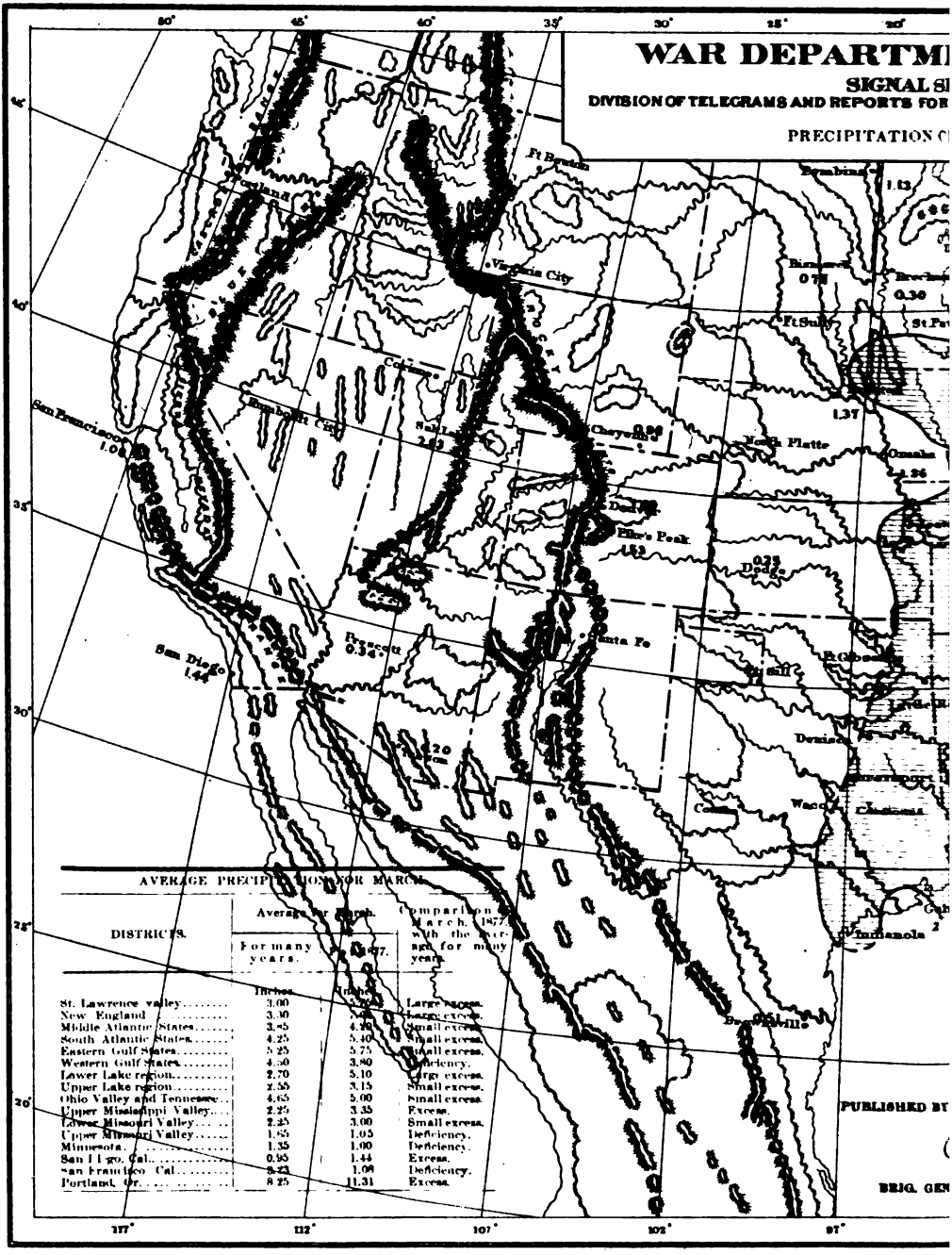
No. XII. While low barometer No. X was on the 24th central in the Lower Mississippi Valley, and high barometer No. XI was extending eastward, north of the Lake region, the pressure fell slightly at the Rocky Mountain stations and in Manitoba, and, on the afternoon of the 25th, the southern end of the depression extended southward over Minnesota. By the afternoon of the 26th the barometer had risen over the Upper Lakes, but had fallen in Nebraska and the Southwest. At 11 p. m. the depression was central in Kansas. At 7.35 a. m., 27th, it had moved southward into Indian Territory, while the barometer had risen rapidly to the northward. The central depression continued at the extreme southwestern limit of our stations until the afternoon of the 29th, by which time high barometer No. XII had moved southeastward to the Lakes, while the pressure had also been diminishing at all the Pacific coast and Rocky Mountain stations. Consequently, at 4.35 p. m. of the 29th, the isobar of 30.00 stretched from Manitoba southward over Texas, with a large region of low barometer to the westward, the greatest depression being probably in Wyoming or Idaho. During the next twenty-four hours' pressure continued slowly falling between the Mississippi and Rocky Mountains, but rose on the Pacific coast, and at 4.35 p. m. of the 30th the central depression was probably in Southern Dakota; at 11 p. m. it had moved southward to Nebraska, but at 4 35 p. m. of 31st was in the southeastern corner of Dakota, and at 11 p. m. in Southern Minnesota. At this latter date the area of threatening and rainy weather covered the Middle States, Gulf States, Northwest and Lake region. The further history of the storm belongs to April.

Vessels experiencing storms.—Reports of storms at sea have been gathered from miscellaneous sources as follows: 1st, 35° 20′ north, 63° 45′ west, hurricane; from latitude 43° to 45° north, and longitude 44° to 56° west, strong north and west gales. 2d, from 34° north to 45° north, off the Middle Atlantic coast, severe northeast to southeast gales. 9th, off the Middle Atlantic coast, southeast to southwest winds of hurricane force. 22d, in 34° north, 74° west, a southeast gale, lasting 26 hours. 25th, 49° 32′ north, 22° 23′ west, strong gale and high sea. 27th, 32° 17′ north, 78° 12′ west, heavy northwest gale. 30th, off Cape Hatteras, heavy north gale, lasting 34 hours.

TEMPERATURE OF THE AIR.

The general distribution of temperature for the month is shown by the isotherms upon Chart No. II. As the temperatures here given depend entirely upon the observations made at the regular Signal Service and Canadian stations, they have, in the small table upon the same chart, been compared with the observations made at the same stations since their establishment in 1870, or subsequently. This comparison shows that the present month has been slightly warmer than during recent years throughout the Atlantic States, and also on the Pacific coast, but has been slightly colder in the Saint Lawrence Valley, the Lake region, Ohio Valley, and Northwest. Reports from Newfoundland show the month to have been unusually warm in that region. The isotherm of 60° passes from Southern Georgia along the East Gulf coast through Southern Louisiana into Texas. The isotherm of 20° passes from the mouth of the Saint Lawrence southwest to Lake Huron, and thence west-northwest to Central Dakota. The average temperature at the summit of Pike's Peak was 12°, and at Mount Washington 11°.5. The mean for San Diego is 59° instead of 51°; whence the average for the whole Pacific coast is higher than the normal by about 3°.

Maximum and minimum temperatures.—The maxima above 80° were: 89° at Corsicana



DISTRICTS.	Average for March. For many years.	Average for March. 1877.	Comparison of March, 1877, with the average for many years.
	Inches.	Inches.	
St. Lawrence valley	3.00	2.00	Large excess.
New England	3.30	4.00	Large excess.
Middle Atlantic States	3.45	4.20	Small excess.
South Atlantic States	4.25	5.40	Small excess.
Eastern Gulf States	5.25	5.75	Small excess.
Western Gulf States	4.50	3.80	Deficiency.
Lower Lake region	2.70	5.10	Large excess.
Upper Lake region	2.55	3.15	Small excess.
Ohio Valley and Tennessee	4.65	5.00	Small excess.
Upper Mississippi Valley	2.25	3.35	Excess.
Lower Missouri Valley	2.25	3.00	Small excess.
Upper Missouri Valley	1.65	1.05	Deficiency.
Minnesota	1.35	1.00	Deficiency.
San Diego, Cal	0.95	1.44	Excess.
San Francisco, Cal	3.23	1.08	Deficiency.
Portland, Or	8.25	11.31	Excess.

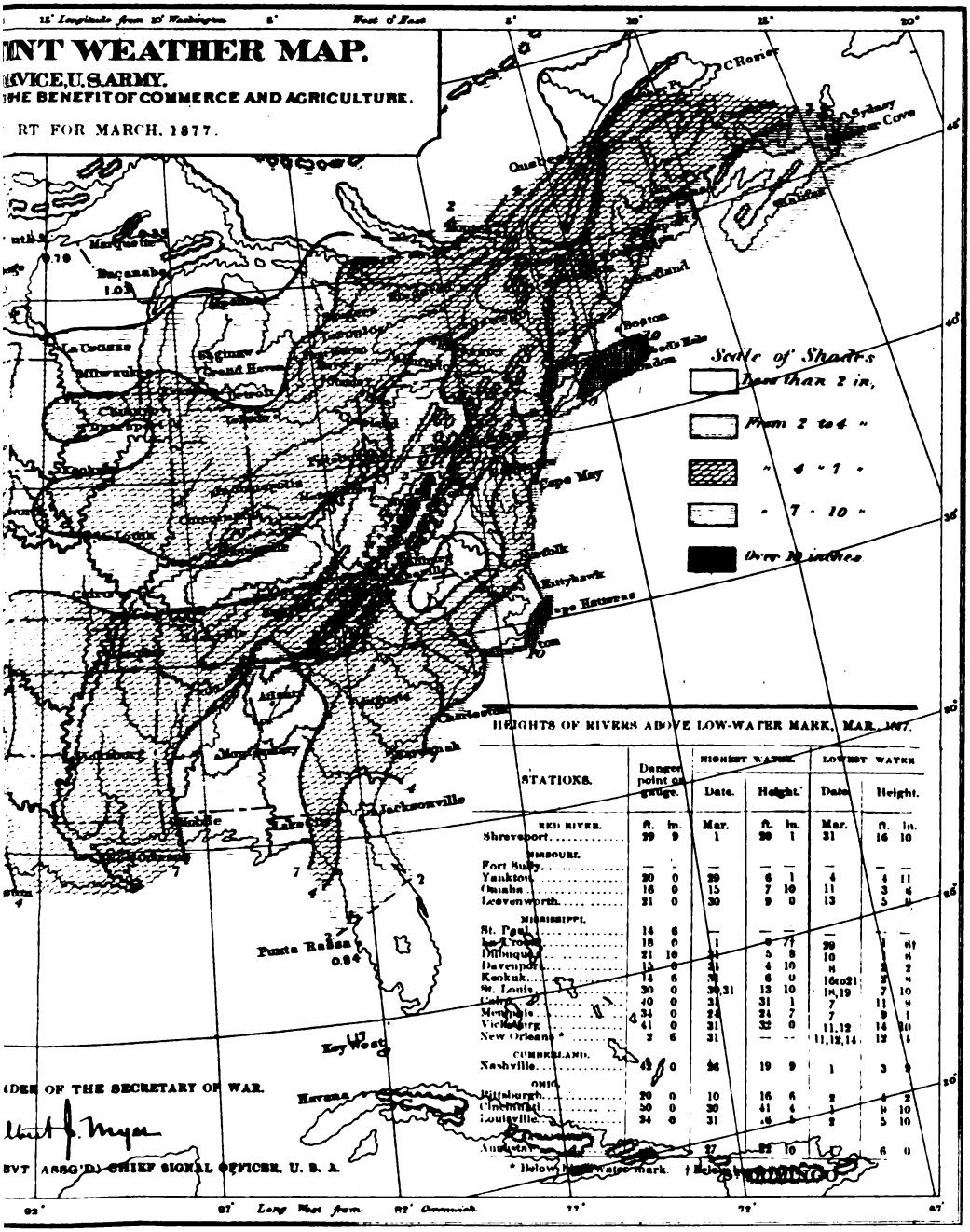
No. III.

INT WEATHER MAP.

SVICE, U. S. ARMY.

HE BENEFIT OF COMMERCE AND AGRICULTURE.

RT FOR MARCH, 1877.



HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, MAR., 1877.

STATIONS.	Danger point on gauge.		HIGHEST WATER.			LOWEST WATER		
			Date.	Height.		Date.	Height.	
RED RIVER.	ft.	in.	Mar.	ft.	in.	Mar.	ft.	in.
Shreveport	29	9	1	29	1	31	16	10
MISSOURI.								
Fort Sully	—	—	—	—	—	—	—	—
Yankton	20	0	29	6	1	4	4	11
Omaha	16	0	15	7	10	11	3	6
Leavenworth	21	0	30	9	0	13	5	8
MISSISSIPPI.								
St. Paul	14	6	—	—	—	—	—	—
La Crosse	18	0	1	6	11	29	1	01
Dubuque	21	10	31	5	8	10	1	8
Davenport	13	0	31	4	10	8	2	2
Keokuk	14	6	30	6	0	16to21	3	8
St. Louis	30	0	30,31	13	10	18,19	7	10
Cairo	40	0	31	31	1	7	11	8
Memphis	34	0	24	24	7	7	9	1
Vicksburg	41	0	31	32	0	11,12	14	10
New Orleans *	2	6	31	—	—	11,12,14	12	4
CUMBERLAND.								
Nashville	40	0	26	19	9	1	3	9
OHIO.								
Pittsburgh	20	0	10	16	6	2	4	2
Cincinnati	50	0	30	41	4	2	9	10
Louisville	24	0	31	36	4	2	5	10
Augusta				37	11	25	6	0

* Below [illegible] Water mark. † Below [illegible]

DER OF THE SECRETARY OF WAR.

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BVT ASSG'D CHIEF SIGNAL OFFICER, U. S. A.

on the 16th; 87° Boerne, 14th; 84° Dodge City, 22d; 83° Key West, 4th and 8th, Shreveport, 27th, and Fort Sill, 26th; 82° Saint Marks, 28th; 81° Jacksonville, 28th, and Denison, 27th; 80° Punta Rassa, 5th, Fort Gibson, 27th. The maxima below 45° were: 31° at Pike's Peak on the 26th; 36° Mount Washington, 27th and 28th; 43° Alpena, 29th, and Breckenridge, 28th and 31st; 44° Escanaba, 29th; 45° Pembina, 28th. The minima above 35° were: 58° Key West, 22d; 50° Punta Rassa, 11th; 47° San Francisco, 31st; 39° Galveston, 9th, and New Orleans, 10th; 37° Indianola, 9th; 36° Jacksonville, 10th. The minima below —8° were: —22° at Pembina, 7th; —21° Mount Washington, 19th; —14° Yankton, 8th, and Breckenridge, 24th; —10° Pike's Peak, 8th, and Alpena, 17th; —9° Saint Paul, 9th, Escanaba, 20th, Virginia City, 3d.

Ranges of temperature.—Large diurnal ranges are reported, as follows: Denver, 48°, Cheyenne, 41°, 5th; Dodge City, 50°, 17th; Denison, 40°, 8th; Yankton, 38°, Leavenworth, 42°, Mount Washington, 38°, 1st. The largest monthly ranges were 79° at Yankton, 77° at Dodge City, 75° at Denver, 73° at Omaha, 71° at Leavenworth, 57° at Mount Washington. The smallest monthly ranges: 39° at Cape Hatteras and Eastport, 38° at New Orleans, 37° at Thatcher's Island, 36° at Galveston, 26° at San Francisco.

Frosts, as reported from Southern States, are as follows; Alabama, Carlowville, on the 3d, 6th, 7th, 10th, 11th, 15th, 16th, 18th, 22d, 26th. Arkansas, at Mount Ida, very frequent, and at Monticello on the 6th, 9th, 10th. Florida, at Milton, 6th, 7th, 23d; Newport, 7th, 10th, 11th, 15th; Welborn, 11th; Mayport, 16th, 19th; Daytona, 19th. Georgia, Saint Mary's, 7th, 11th, 18th, 19th. Louisiana, Point Pleasant, 6th, 10th, 18th. Mississippi, Brookhaven, 3d, 6th, 10th, 18th, 22d; Fayette, 6th, 10th, 18th, 22d, 26th. North Carolina, Weldon, 11th, (heavy;) Lenoir, 30th, (black frost.) South Carolina, Spartanburg, 6th, 7th, 10th, 30th, 31st. Texas, Clarksville, 4th, 5th, 6th, 8th, 9th, 10th, 17th, 25th; Melissa, 4th, 5th, 6th, 8th, 25th; Austin, 4th, 18th. Virginia, Hampton, 1st, 6th, 10th, 11th, 15th, 16th, 18th, 19th, 20th.

Ice.—The formation of ice in small rivers, ponds, &c., is reported as follows: New York, at Wappinger's Falls, pond-ice, 6 inches thick, 1st; Vermillion, pond-ice, 20 inches thick, at close of month. Vermont, Lunenburg, pond-ice, 20 inches thick, at close of month.

PRECIPITATION.

The general distribution of rain or melted snow is shown upon Chart No. III, from which it will be seen that a large excess of rain has fallen over the Lower Lakes, Saint Lawrence Valley, and New England. A deficiency is reported from the Western Gulf States and Upper Missouri. In other regions a slight excess has fallen.

Small monthly rain-falls.—Stations reporting very small rain-falls: Tucson, Ariz., and Fort Hartsuff, Nebr., 0.20; Camp Lowell, Ariz., 0.19; Fort Larned, Kans., 0.18; Fort Bridger, Wyo., 0.16; Santa Fé, N. Mex., and Rio Grande, Tex., 0.14; South Pueblo, Colo., 0.13; Fort Sill, Ind. Ter., and Jacksboro, Tex., 0.11; Fort Garland, Colo., 0.16; Stanwix, Ariz., 0.05 inch.

Largest monthly rain-falls.—Stations reporting large monthly rain-falls are as follows: Worcester, Mass., 9.03; Mount Desert, Me., 9.04; New Bedford, Mass., 9.05; Sandy Hook, N. J., 9.09; Waltham, Mass., 9.35; Somerset, Mass., 9.43; Boston, Mass., 9.79; Newport, R. I., 10.02; Cape Hatteras, N. C., 10.41; Fort Warren, Mass., 10.48; Fall River, Mass., 10.58 and 10.73; Wood's Holl, Mass., 10.78; New London, Conn., 10.96; Portland, Oreg., 11.31; Mount Washington, 11.64 inches.

Largest daily rains and snows.—In the rear of storm No. X heavy snows fell; thus, in Luzerne County, Pa., 18 inches fell on the 27th, 28th, and 29th. The heaviest rains were: 1st, at Mobile, 3.26 inches, New Orleans, 3.02; 21st and 22d, Kittyhawk, 3.48; 22d and 23d, Wood's Holl, 3.89; 22d, Cape Hatteras, 3.60; 25th, Gainesville, Ga., 3.00; 25th and 26th, Spartanburg, S. C., 3.00; 36th, New London, 3.80; 26th and 27th, Springfield, Mass., 3.96; Sandy Hook, 3.94; 27th, Mount Washington, 5.29.

Snow-fall.—The general distribution of the monthly snow-fall was as follows: At various stations in Texas and Mississippi, from 0.3 to 0.5 inch; in the eastern half of Colorado, and in Nebraska and Kansas, 1 to 5; Tennessee, South Carolina, and Virginia, 0.3 to 7; Dakota and Minnesota, 11 to 15; in Iowa, Illinois, Indiana, and Ohio, varies from 1 to 32; along the Middle and East Atlantic coasts, from 2 to 16; in the Lake region, and on the west slope of the Alleghanies, from 9 to 41. The highest figures reported are: 33 inches at Litchfield, Mich., and Madison, Wis.; 36 inches at Geneva, Wis.; 41 inches at Belvidere, Ill.

Depth of snow at close of month.—At exposed stations in New York, Michigan, Wisconsin, and Minnesota there still laid on the ground from 2 to 8 inches.

Cloudy days.—The number of days upon which the cloudiness has averaged eight or more, on a scale of ten, as reported principally by voluntary observers, ranges throughout the Middle and Eastern States from 9 to 23; South Atlantic States, 5 to 9; Ohio Valley and Tennessee, 8 to 15; Lower Lakes, 9 to 23; Upper Lakes, 5 to 16; Northwest, 6 to 14; from Colorado to the Missouri Valley, 3 to 17; Gulf States, 5 to 11. The least cloudiness is reported from Colorado, 3 days, and the greatest from New York, 23 days.

Rainy days.—The number of days on which rain or snow has fallen, as reported by the Signal Service observers, is least at Fort Dodge, Kans., 4 days, and greatest at Rochester, N Y., 25 days. An average of 4 or 5 days is reported over the region from Nebraska to Northern Texas, as also at Galveston and San Francisco; 6 to 7 in Northern Florida; 9 to 12 are reported in the remaining portion of the Gulf States, Georgia, South Carolina, and the interior of North Carolina, as also over a narrow belt from Louisiana to Dakota; 19 to 23 are reported from the immediate coast between New Jersey and the Bay of Fundy; 20 to 25 are reported from the southern shores of Lakes Michigan, Huron, and Ontario.

RELATIVE HUMIDITY.

The lowest monthly averages of relative humidity have been as follows: Cheyenne and Montgomery, 60; Cairo and Nashville, 59; Fort Gibson, 58; Lynchburg, 54; Salt Lake City, 53; Santa Fé, 32 per cent. The highest monthly averages have been: Mount Washington, 88 (uncorrected); Albany and Erie, 82; Cape May and Pembina, 81 per cent.

WIND.

Prevailing winds are shown by the arrows upon Chart No. II. Southerly winds are reported from numerous stations west of the Mississippi. Southwest to northwest winds are reported from most stations in the Lake region, Middle and Eastern States.

Total movements of the air.—The largest total movements are: Pike's Peak, 20,646 miles; Cape May, 16,283; Sandy Hook, 14,060; Cape Lookout, 13,721; Kittyhawk, 13,379; Barnegat, 12,575; Thatcher's Island, 12,126. The smallest total movements have been: Nashville, 4,503; Shreveport, 4,426; Lynchburg, 4,364; Salt Lake City, 4,219; Augusta, 3,964; Dubuque, 3,573.

Highest winds.—The highest hourly velocities reported during the month are: At Mount Washington on the 4th and 19th, northwest, 102; Pike's Peak, 6th, 84; Boston, 9th, southeast, 72; Dodge City, 3d, — 72; Kittyhawk, 22d, north, 72; and Breckenridge, — 75 (estimated).

Local storms, tornadoes, &c.—On the 8th tornadoes passed over Mississippi, Alabama, and Georgia. One appears to have developed in the southwestern part of Mississippi, passed northeastward to Tallapoosa County, Alabama. Another passed over Mitchell, Thomas, Colquit, and Worth Counties, Georgia. Martinsville, Ill., March 20th, 6.40 p. m., "a regular whirlwind, or series of whirlwinds, moving due east. One passed about twenty links south of house; vortex was from four to six rods wide, blowing down trees, fences, hay-stacks, &c. Another whirlwind, similar to the above, passed about six miles to the north."

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily weather "indications," with the telegraphic weather reports for the succeeding twenty-four hours, shows a general percentage of verifications of 84.6, and of omission, 0.5 per cent. The percentages for the four elements have been: Weather, 86.6; wind, 83.2; temperature, 85.1; barometer, 83.7. The percentages for the geographical districts have been: New England, 82.8; Middle Atlantic States, 83.1; South Atlantic States, 88.6; East Gulf States, 89.4; West Gulf States, 85.8; Lower Lakes, 83.2; Upper Lakes, 80.1; Ohio Valley and Tennessee, 83.3; Lower Missouri Valley, 84.5; Upper Mississippi Valley, 85.6.

Cautionary signals.—During the month 248 cautionary signals have been displayed at stations on the Gulf and Atlantic coasts and on Lake Michigan. Of these, 207, or 83 per cent., were justified by subsequent high winds within 100 miles of the station where they were displayed, and 41, or 17 per cent., were not justified so far as known. Sixty-one instances of high winds when no signals were ordered were also reported from these stations during the month, of which 13 occurred at Cape Lookout, N. C., where the orders to hoist signals were not received, owing to interrupted telegraphic communication.

NAVIGATION.

The highest and lowest stages of the rivers are shown in the table on Chart No. III. With but few exceptions the rivers were decidedly higher at the close of the month than at the beginning. Several illustrations have occurred during the month of the effect of strong winds on the depth of water; for instance, southerly winds prevailed throughout the Mississippi and Missouri Valleys on the 5th, but a high "norther," on the 6th, 7th, and 8th, advanced southward. It prevailed at Omaha from the 6th to 10th; at Leavenworth from the 7th to 10th; at Saint Louis and below from the 8th to 10th. The water was driven southward from the upper stations, falling 4 feet 2 inches at Plattsmouth, 2 feet at Saint Joseph, &c., but was heaped up at Cairo 3 feet 1 inch, and less at lower stations, remaining nearly stationary at Saint Louis. Many of the lowest waters recorded on Chart No. III occurred during this period.

Ice in rivers and harbors.—The following reports have been received in relation to the opening of navigation and other phenomena: Albany, ice broke up, and moved down slowly, without damage, 11th; first boat of season from New York 30th. Alpena, bay clear of ice 31st. Bangor, ice moved out of Penobscot and navigation opened 29th. Chicago, lake full of ice, driven down by north winds, 29th. Cleveland, ice broken and driven from shore 2d; lake filled with broken ice 5th; frozen 15th; ice broke up 22d. Dubuque, gorged 8th; frozen and lower than ever known 9th; opened 27th. Davenport, river full of floating ice 9th; frozen over 10th; floating ice 14th to 25th; clear of ice 26th; ferry-boat resumed trips 28th; navigation opened 30th. Keokuk, floating ice 8th, 9th, 12th, 14th; navigation suffering by reason of low water 17th. Warsaw, Ill., water lower than ever known at this season. Leavenworth, floating ice 8th to 12th and 18th. La Crosse, frozen 8th to 26th; ice moved 26th; went out suddenly 27th; lowest water on record 29th, 18 inches below bench-mark. Omaha, floating ice until 19th; first boat of season 31st. Pittsburgh, floating ice 10th, 19th. Philadelphia, heavy floating ice in Delaware 11th. Saint Paul, ice broke up and moved out 30th and 31st. Toledo, ice moved out of river 1st; frozen 18th; floating ice 28th. Yankton, river frozen 9th to 11th. Port Huron, lake and river clear of ice 1st. Youngstown, N. Y., ice in river 6th, 7th, 10th, 11th, 12th, 14th to 22d. Firesteel, Dak., ice all gone out of James River 26th. Fort Madison, Iowa, ice running in Mississippi River 8th, 13th. Gardiner, Me., ice in Kennebec started 8th; navigation opened 31st. Florida, Mass., ice in Deerfield River broke and moved down 9th. Contoocookville, N. H., ice in Contoocook River breaking up 26th. Wappinger's Falls, N. Y., first boat from New York City 1st. Poughkeepsie, N. Y., ice broke up 9th. Troy, N. Y., navigation opened 30th. Tioga, Pa., ice broke 2d. Bismarck, Dak., ice in Missouri breaking up 30th; an ice-gorge formed at Sibley Island, and bottom-lands for many miles were overflowed, causing loss of life and property. The snow-fall in the mountains has been very heavy, and a good stage of water is expected in the Missouri.

TEMPERATURE OF WATER.

The temperature of the water is shown by the table on Chart No. II. It will be noticed that the temperatures are below those for March, 1876, by from 2° to 5° at nearly all stations on the Mississippi and its tributaries, being higher only at Pittsburgh and Keokuk. Along the Middle and East Atlantic coasts the temperatures are a few degrees higher than in 1876.

ATMOSPHERIC ELECTRICITY.

Thunder-storms occurred as follows: On the 1st in Kansas, Louisiana, Missouri, Mississippi; 2d, Illinois, North Carolina; 3d, Pennsylvania, Tennessee; 7th, North Carolina, Texas; 8th, Alabama, North Carolina, Arkansas, Florida, Georgia, Illinois, Indiana, Louisiana, Mississippi, South Carolina, Tennessee, Texas, Indian Territory; 9th, Florida, Georgia, North Carolina, South Carolina, Texas, Virginia; 12th, Alabama, Louisiana, Kansas, Mississippi, Texas, Missouri; 13th, Florida, Georgia, Louisiana, Mississippi, North Carolina, Texas; 14th, North Carolina; 16th, Ohio, Illinois, Indiana, Louisiana, Tennessee, Texas, Kentucky; 17th, Florida, Louisiana, Missouri, Mississippi, North Carolina, Tennessee; 19th, Illinois, Kansas; 20th, Alabama, Kansas, Illinois, Indiana, Iowa, Michigan, Missouri, Mississippi, Nebraska, Ohio, Tennessee, Texas; 21st, Connecticut, Florida, Georgia, Massachusetts, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Texas, Virginia, South Carolina, Rhode Island; 22d, Illinois, Iowa, Kansas, Massachusetts, Missouri, Texas; 23d, Illinois, Iowa, Texas; 24th, Louisiana, Mississippi; 25th, Florida, Georgia, Maryland, North Carolina, Virginia, Tennessee; 26th, New Jersey; 27th, Wyoming; 28th, Georgia, Iowa, New Mexico, Texas; 29th, California, Iowa, Kansas; 30th, Colorado, Dakota, Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, Wisconsin; 31st, Arkansas, Dakota, Illinois, Indiana, Indian Territory, Iowa, Kansas, Minnesota, Ohio, Texas, Wisconsin.

Lightning, without thunder, was recorded as follows: 1st, Florida; 2d, Pennsylvania, Georgia; 5th, Florida; 7th, Kansas, Indian Territory, Texas; 8th, Georgia, Florida, Kansas; 11th, Texas; 12th, Indian Territory, Texas; 13th, North Carolina, Texas; 14th, Florida; 16th, Texas, Louisiana; 19th, Texas; 20th, Missouri, Ohio; 21st, Maine, Nebraska, North Carolina, Pennsylvania; 22d, Illinois, Iowa, Kansas; 23d, 27th, and 28th, Texas; 29th, Kansas; 30th, Dakota, Colorado; 31st, Nebraska, Kansas.

Auroras are reported as follows: 1st, Southington, Conn.; Cornish, Eastport, Bangor, and Portland, Me.; Waltham, Mass.; Auburn and Contoocookville, N. H. 3d, Waltham, Mass.; Lunenburg, Vt. 4th, Gardiner, Me.; Pembina, Dak.; and, possibly, Denison, Tex. 6th, Pembina, Dak. 8th, Fort Abercrombie, Dak. 9th, observed at 56 stations, as follows: In Maine, 4; Vermont, 1; Massachusetts, 3; Connecticut, 1; Rhode Island, 1; New York, 3; New Jersey, 4; Ohio, 6; Indiana, 2; Michigan, 5; Illinois, 3; Wisconsin, 6; Iowa, 8; Missouri, 1; Minnesota, 4; Nebraska, 1; Dakota, 3. 10th, Fort Brady, Alpena, and Escanaba, Mich.; Cornish and Gardiner, Me.; Au-

burn, N. H.; Jacksonburg, Ohio; Embarrass and Wautoma, Wis.; Bismarck, Dak. 11th, Pembina, Dak. 12th, Escanaba and Fort Brady, Mich.; Manitowoc, Wis. 14th, New York City. 18th, Litchfield, Mich. 19th, Monticello, Iowa. 23d, Litchfield, Mich.; Lunenburg, Vt. 30th, New York City. 31st, Malone, N. Y.

Telegraphic ground-currents.—The observer at Pike's Peak reports ground-currents on the 27th.

OPTICAL PHENOMENA.

Solar halos.—1st, Michigan, Ohio, Utah, North Carolina, Virginia; 2d, Iowa, Maine, New Hampshire, New York, Rhode Island; 3d, Iowa, Nebraska, Virginia; 4th, Iowa, Ohio; 5th, New York, South Carolina, Florida, Rhode Island, Connecticut, Georgia; 6th, Iowa, Missouri, Ohio, Pennsylvania, Wisconsin, New York; 7th, Dakota, Delaware, Iowa, Maryland, Michigan, New Hampshire, New Jersey, New York, Ohio, Wisconsin; 8th, Iowa, Nebraska, New Hampshire, Wisconsin, Georgia, New Jersey; 9th, Iowa, Michigan; 10th, Iowa, Nebraska, New York; 11th, Iowa, Maryland, Ohio, Minnesota, Pennsylvania, Texas; 12th, Michigan, Virginia; 13th, Michigan, Nebraska, Wisconsin, Florida, North Carolina; 14th, Connecticut, Maine, Michigan, New Hampshire, Vermont; 16th, Maine, Massachusetts, New Hampshire, New York; 17th, Maine, New Hampshire, New York, South Carolina; 18th, Kansas, Michigan, New York, Tennessee, Nebraska, Dakota; 19th, Maine, New Hampshire, New York, Tennessee, Vermont, Wyoming; 20th, Delaware, Maine, Michigan, New York, Ohio, Pennsylvania, New Jersey, Illinois, Virginia, Florida, New Hampshire, Georgia; 21st, Delaware, Maine, New York; 22d, Connecticut, Maine, Massachusetts, Nebraska, New Hampshire, New York, Ohio, Pennsylvania; 23d, Indiana, Michigan, Vermont, Wisconsin, New Hampshire; 24th, Delaware, Indiana, Michigan, Wisconsin, Iowa, Florida, Rhode Island; 25th, Connecticut, Nebraska, New Hampshire, New York, Maine, Rhode Island; 26th, Ohio, Tennessee; 27th, California, Kansas, Mississippi, Tennessee, Texas, Indian Territory; 28th, Iowa, Nebraska, Tennessee, Wisconsin; 29th, New York; 30th, Ohio, Georgia; 31st, California, Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York, Vermont, South Carolina, Texas, North Carolina.

Lunar halos.—1st, Delaware, Maryland, New Jersey, New York, Ohio, Iowa, Virginia, Connecticut, Pennsylvania; 2d, New Jersey, Tennessee; 4th, Virginia; 5th, Pennsylvania; 7th, Indiana, Pennsylvania, Virginia; 12th, Virginia, Maine; 18th, California, Kansas, Michigan; 19th, Indiana, Iowa, New York, Kansas, North Carolina; 20th, California, Connecticut, Iowa, New Hampshire, New York, Ohio, Vermont, North Carolina, West Virginia, Louisiana; 21st, Maine, Nebraska, Wisconsin, New York, Dakota; 22d, California, Dakota, Illinois, Indiana, Louisiana, Maine, Michigan, Mississippi, Nebraska, New York, Minnesota, Vermont, Texas, New Hampshire; 23d, Connecticut, Delaware, Georgia, Indiana, Louisiana, Maine, Massachusetts, Nebraska, New Hampshire, New Jersey, New York, Wisconsin, Michigan, Minnesota, Tennessee, North Carolina, California; 24th, Florida, Illinois, New Hampshire, New York, Pennsylvania, Michigan, Wisconsin, West Virginia, Georgia, North Carolina, Kansas; 25th, California, New York, Tennessee, Vermont, Dakota, Maine, Indian Territory, New Hampshire, Missouri, Kansas; 26th, Californuia, Illinois, Michigan, Missouri, Ohio, Tennessee, New York, Minnesota, Texas, Alabama, Kansas; 27th, Missouri, Tennessee, Utah, Texas, Indian Territory, Florida, Alabama, North Carolina, Kansas; 28th, Iowa, Missouri, Tennessee, Utah, Minnesota, Kansas, Alabama, Louisiana, North Carolina; 29th, North Carolina, Tennessee, Wisconsin, Kentucky, Georgia, Mississippi; 30th, New York, Ohio, Virginia, North Carolina; 31st, Georgia, North Carolina.

Mirage.—5th, Sedgwick, Kans.; 6th and 10th, Tybee Island, Ga.; 9th, Galveston, Tex.; 12th, Dodge City, Kans.

MISCELLANEOUS PHENOMENA.

Zoological.—Wild geese were observed on the 1st in Kansas, flying south, Indian Territory and Nebraska, north, Illinois, —; 2d, —, Virginia, Kansas, and Massachusetts, north, Iowa, north and east, Missouri, south; 3d, Tennessee, north; 4th, Virginia, north; 5th, Ohio, south; 6th, Tennessee, north; 7th, Massachusetts, north; 8th, Ohio, south; 9th, New York, south; 10th, Missouri, north; 11th, Kansas, northeast; 12th, Indiana, southeast; 13th, Iowa and Kansas, south; 17th, Texas, north; 18th, Kansas, north; 19th, Missouri, north; 20th, Ohio, —; 23d, Indiana, —; 24th, Maryland, New Jersey, and Pennsylvania, north, Ohio, south; 26th, Kansas, north; 27th, Texas, north, Dakota, —; 28th, Kansas, north, Indiana, Iowa, —; 29th, Kansas, north, Iowa, north; 30th, Kansas, north and south, Dakota, north; 31st, Iowa and Connecticut, north, Michigan, northwest, New Hampshire, —. *Wild ducks* were observed on the 1st in Tennessee, flying north, Illinois, —; 2d, District Columbia, south; 7th, Kansas, north; 10th, Iowa, north; 13th, West Virginia, south; 18th, New York, south; 21st, North Carolina, north; 25th, Iowa, east; 27th, Maryland, north; 30th, Indiana and Iowa, north; 31st, Iowa, New Hampshire, and Ohio, north. *Robins*, in Illinois, on the 3d, 22d, 28th, and 30th; Indiana, 22d; Iowa, 28th, 29th, 31st; Maine, 28th,

31st; Maryland, 4th; Massachusetts, 1st, 4th, 10th, 27th; Michigan, 27th, 30th; New Hampshire, 5th, 25th; New Jersey, 20th; New York, 4th, 21st, 23d, 25th, 31st; Ohio, 7th, 8th; Pennsylvania, 4th, 24th; Utah, 24th; Vermont, 26th, 31st; Virginia, 1st, 2d, 5th; Wisconsin, 28th, 29th; District of Columbia, 2d. *Bluebirds*, Florida, 1st; Illinois, 13th, 22d, 27th; Indiana, 22d; Iowa, 10th, 24th, 28th; Maine, 29th, 30th; Massachusetts, 1st, 4th, 11th, 24th; Michigan, 30th; Nebraska, 18th; New Hampshire, 3d, 24th; New Jersey, 7th; New York, 22d, 23d, 31st; Ohio, 2d, 29th; Utah, 24th; Vermont, 31st; Wisconsin, 25th, 31st. *Blackbirds*, Connecticut, 29th; District of Columbia, 2d; Illinois, 28th; Indiana, 26th, 31st; Iowa, 28th, 31st; Kentucky, 19th; Maryland, 9th; Massachusetts, 12th; Michigan, 30th, 31st; New Hampshire, 6th; New York, 26th; Ohio, 4th, 16th, 22d, 27th, 31st; Pennsylvania, 7th; Tennessee, 19th; Wisconsin, 29th. *Meadow-larks*, Illinois, 26th, 29th; Indiana, 23d; Iowa, 15th, 26th; Kansas, 17th; Maryland, 5th; Missouri, 27th; Nebraska, 20th, 23d; New Hampshire, 28th; Ohio, 22d; Utah, 24th; Wisconsin, 21st. *Martins*, Indiana, 23d; Iowa, 31st; Kentucky, 29th; North Carolina, 24th, 28th; Ohio, 31st; Texas, 3d, 11th; Virginia, 31st. *Wild-pigeons*, Iowa, 29th, flying north, and 31st, —. *Song-sparrows*, Iowa, 3d; Maine, 31st; Massachusetts, 5th; Wisconsin, 26th. *English sparrows*, at Fall River, Mass., and Newport, R. I., disappeared on breaking of cold weather. *Killdeer*, Delaware, 1st; Nebraska, 20th; New York, 25th; Ohio, 25th; Wisconsin, 29th. *Doves*, Florida, 1st; Ohio, 12th. *Snipe*, Illinois, 30th; New York, 3d, 25th; Ohio, 25th. *Woodpeckers*, Massachusetts, 27th; Ohio, 25th. *Cranes*, Southern Illinois, flying north and northeast nearly every day; Indiana, 23d; Kansas, north, 6th and 17th; Nebraska, north, 17th, 28th. *Phebe or Pewee bird*, Indiana, 3d; Iowa, 29th; Nebraska, 27th; New York, 25th; North Carolina, 28th; Vermont, 31st. *Swans*, Iowa, flying southwest, 5th. *Plover*, Iowa, 30th. *Blue-jays*, Iowa, 12th and 20th. *Yellow-birds*, Massachusetts, 10th. *Mocking-birds*, Iowa, 15th; Indian Territory, 13th; Virginia, 25th. *Swallows*, Indian Territory, 15th. *Grasshoppers*, 30th, Brazos County, Tex., are doing great damage to gardens and small grains, and seem to be increasing in numbers; 31st, in Bastrop County, are destroying crops; Corsicana, Tex. (at close of month), numerous and destructive, still too small to fly, are expected to migrate before cotton is large enough to be damaged; Daytona, Fla., hatching, 15th; Tabor, Ohio, estimated that in places thirty-five bushels of eggs are deposited per acre; the warm weather of February developed near to hatching immense numbers of them, which it is believed were destroyed by the subsequent cold weather; Arkansas City and Sedgwick, Kans., have begun to hatch; Peach Grove, Kans., ground in many places filled with eggs, and some have commenced hatching out. *Bees*, Massachusetts, 31st. *Fishes—Shad*, in the Yadkin River, North Carolina, 12th; *Herring*, first caught at Fall River, Mass., 2d; Wappinger's Falls, N. Y., 30th. *Hair seal*, killed near New Hamburg, N. Y., on the 21st.

Botanical—In bloom—Peach trees, in Texas, 4th; Indian Territory, 20th; Tennessee, 17th; Virginia, 25th, 28th, and 31st; *Plum trees*, in Tennessee, 22d; *Cherry trees*, in Tennessee, 17th; Virginia, 31st; *Apricot trees*, in Virginia, 26th; *Orange trees*, in Florida, 4th; *Maples*, in New Jersey, 1st; *Lindens*, in New Jersey, 1st.

Prairie and forest fires.—Oregon, Mo., on the 2d, 19th, 29th, 31st; Denison, Tex., 4th, (possibly an aurora,) 10th; Creswell, Kans., 5th, 6th, 13th, 15th, 17th, 26th; Fort Hays, Kans., 13th; Genoa, Nebr., 15th; Dodge City, Kans., 19th, 21st; Cleveland, Tenn., 24th; Monticello, Iowa, 27th.

Meteors.—2d, Guttenberg, Nora Springs, and Monticello, Iowa; 3d, Atco, N. J.; 4th, Rocky Run, Wis.; 7th, Plattsmouth, Nebr.; 9th, Monticello, Iowa; 13th, Waterburg, N. Y., Denison, Tex.; 14th, Point Pleasant, La.; 18th, Fall River, Mass.; 20th, Contoocookville, N. H.; 21st, Fallston, Md.; 22d, Asheville, N. C., Jacksonburg, Ohio, Jackson, Tenn.; 26th, Litchfield, Mich.; 27th, Monticello, Iowa, Danville, Ky., Wooster, Ohio; 28th, Saint Mark's, Fla.

Icebergs.—21st, two icebergs one hundred and fifty feet high, latitude 44° north, longitude 45° 30′ west; 22d, one two hundred feet high, latitude 44° north, longitude 49° 20′ west.

Sunsets.—The characteristics of the sky as indicative of approaching fair or foul weather have been observed daily at sunset at all Signal Service stations. The monthly summaries from 89 stations show that 155 doubtful cases and blanks were recorded, and that out of the remaining 2,604 cases, 1,973, or 75.7 per cent., have been followed by the expected weather.

Polar bands.—1st, Gardiner, Me., Freehold, N. J., Carthagena, Ohio; 2d, Guttenburg, Iowa; 3d, Gardiner, Me., Wytheville, Va.; 7th, Freehold, N. J., Wytheville, Va.; 8th, Wytheville, Va., Tybee Island, Ga.; 9th, Guttenberg, Iowa; 11th, Wytheville, Va., Duluth, Minn.; 13th, Gardiner, Me., Wytheville, Va.; 15th Duluth, Minn.; 16th, Auburn, N. H.; 23d, Auburn, N. H., Tabor, Iowa; 24th, Milwaukee, Wis.; 25th, Auburn, N. H.; 26th, Tabor, Iowa; 27th, Monticello, Iowa; 28th, Tybee Island, Ga., Tabor, Iowa; 29th, Carthagena, Ohio; 30th, Gardiner, Me.

Zodiacal light.—Savannah, 3d, 4th, 6th, 7th, 9th, 10th, 11th, 14th, 15th, 30th; Tybee Island, 6th, 7th; Macon, Ga., 14th; Cornish, Me., 6th, 13th, 30th; Oronoco, Wis., 31st; Cambridge, Mass., 6th, 9th, 10th, 11th, 15th, 30th; Somerset, Mass., 3d, 4th, 5th, 6th;

Oregon, Mo., 3d, 9th, 10th, 15th, 16th, 17th; Contoocookville, N. H., 1st, 4th, 6th, 9th, 10th, 15th; Freehold, N. J., 1st; Atco, N. J., 1st, 3d, 4th, 5th, 10th, 15th, 20th, 30th; Linden, N. J., 15th; North Argyle, N. Y., 15th; Bellefontaine, Ohio, 10th; Carthagena, Ohio, 4th, 5th, 9th, 10th; Wytheville, Va., 3d, 4th, 5th, 10th, 15th, 16th; Carbondale, Ill., 16th; Monticello, Iowa, 4th, 6th, 9th, 12th, 14th, 16th, 26th.

Earthquake.—A severe shock was felt at Kingston, Jamaica, on the 19th, 12.55 a. m.

Published by order of the Secretary of War.

ALBERT J. MYER,
Brig. Gen. (Brevet Assigned,) Chief Signal Officer, U. S. A.

MONTHLY WEATHER REVIEW, APRIL, 1877.

INTRODUCTION.

The present review for the month of April depends upon all data received up to the 15th of May from the Canadian Meteorological Service, the United States Signal-Service, and voluntary observers, the Army post-surgeons and United States Navy. The most noticeable features recorded during the month are: the very severe storms off the Carolina coast from the 5th to the 14th; the general high temperature throughout the country; the excess of rain-fall in the South Atlantic States and Tennessee; the destructive hail-storms and tornadoes; the aurora of the 14th, visible from Dakota to Maine; the partial destruction of the grasshoppers west of the Mississippi by cold weather and snow, showing that the eastward migrations of these insects is probably limited by the vicissitudes of the climate of the Mississippi Valley, whereby they are principally confined to the high, warm, and dry plains that are not frequently visited by late cold weather and snows.

BAROMETRIC PRESSURE.

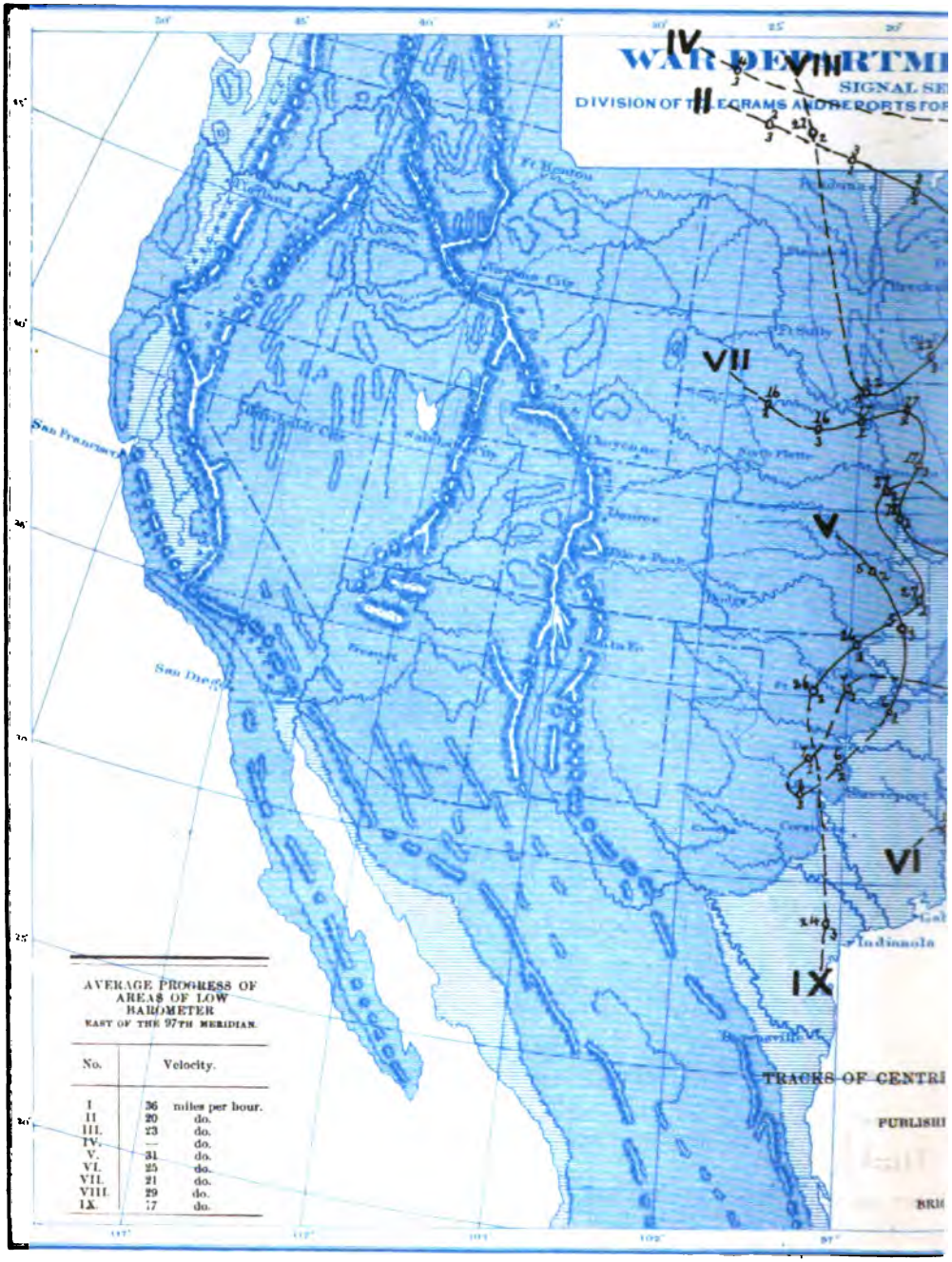
In general.—The general distribution of atmospheric pressure is shown by the isobars upon Chart No. II, for which we see mean pressures of 30.00 or more reported from Southern Florida, and from all Canadian stations. The area of lowest mean, 29.85 or less, extends from Northern Texas to Nebraska. On the Pacific coast, 30.13 is reported from Portland, Oreg., and 30.01 from San Diego and San Francisco. Mean pressures east of the Rocky Mountains are from 0.05 to 0.20 less than during the cold months of April, 1874 and 1875, except in New Brunswick and Nova Scotia. In April, 1876, much higher pressures prevailed in the Southern States, and no marked area of high pressure appeared to exist north of the Saint Lawrence and the Lakes.

Barometric range.—The general range of the barometer over the whole country east of the Rocky Mountains was about 1.50 inches, as may be seen from the following table, which gives the maximum and minimum pressures that occur on the tri-daily maps (7.35 a. m., 4.35 p. m., and 11 p. m., Washington time), near the centers of the respective areas of high and low barometer:

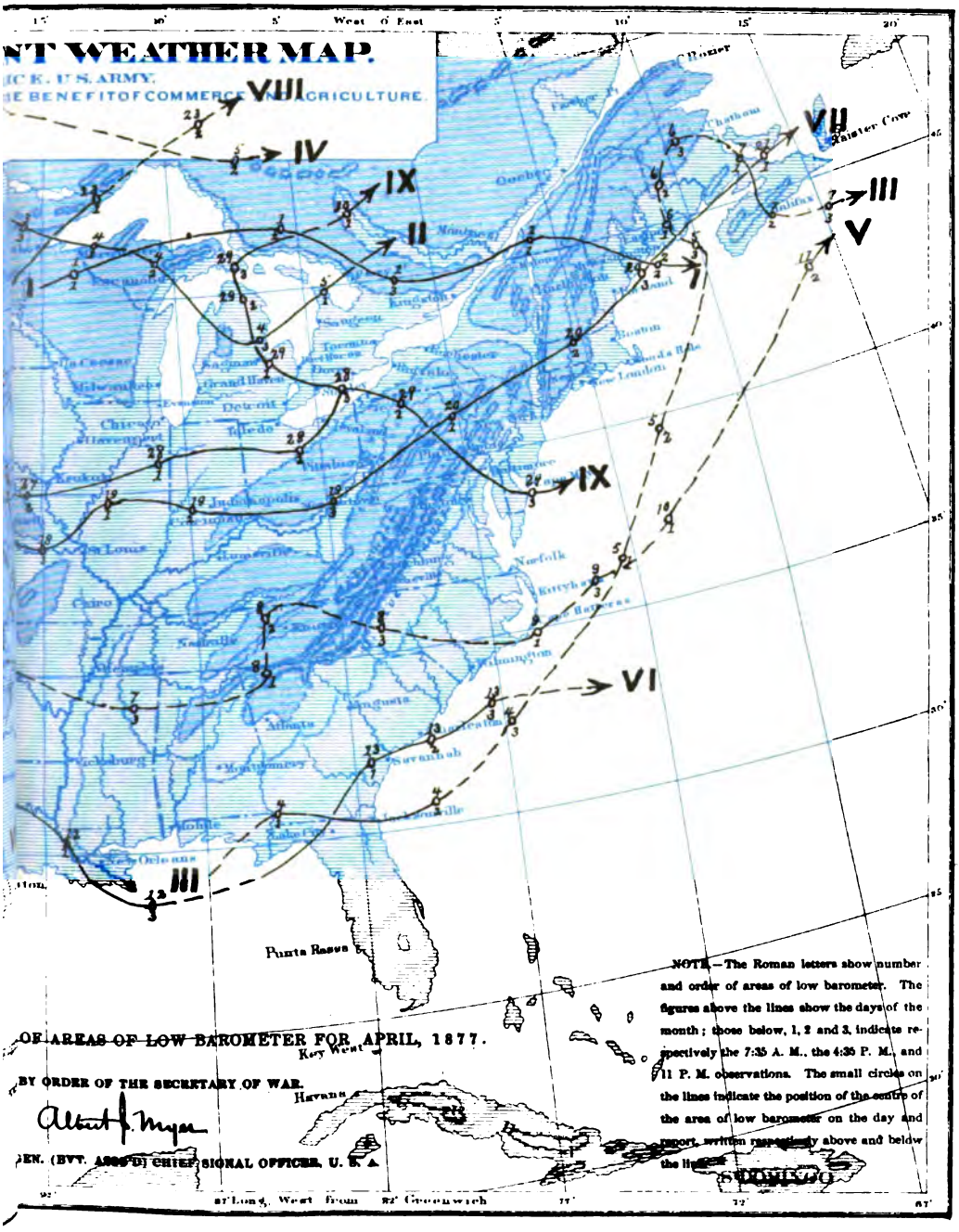
Area.	Low areas.		High areas.	
	Date.	Minimum barometer.	Date.	Maximum barometer.
No. I	April 1	29.28	April 1	30.60
No. II	April 5	29.59	April 2	30.57
No. III	April 6	29.26	April 8	30.20
No. IV	April 5	29.70	April 9	30.39
No. V	April 8	29.18	April 17	30.24
No. VI	April 13	29.30	April 23	30.45
No. VII	April 18	29.11	April 24	30.37
No. VIII	April 22	29.70	April 30	30.22
No. IX	April 28	29.40	.....	.....

The greatest local barometric ranges have been as follows: 1.37 inches at Leavenworth; 1.30 at Eastport; 1.27 at Duluth; 1.26 at Keokuk; 1.22 at Omaha; 1.21 at Yankton. The least local ranges have been: 0.39 at Pike's Peak; 0.72 at Cheyenne and Indianola, and 0.75 at Galveston.

Areas of high pressure.—The areas of high pressure have presented no remarkable feature during the past month; they have extended somewhat to the north of their average position for this season; the average of the eight maximum pressures in the pre-


IV
VIII
II
VII
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IX
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EGRAMS AND REPORTS FOR
Ft Benton
Virginia City
Ft Bridger
Salt Lake City
Cheyenne
Denver
Pike's Peak
Santa Fe
Ft Sully
Ft Laramie
Ft Kearney
Ft Leavenworth
Ft Riley
Ft Scott
Ft Gibson
Ft Smith
Ft Arbuckle
Ft Belknap
Ft Chadbourne
Ft Mason
Ft Inge
Ft Clark
Ft Duncan
Ft Stockton
Ft Davis
Ft Quitman
Ft Bliss
Ft Fillmore
Ft Thorn
Ft Wingate
Ft Defiance
Ft Whipple
Ft Yuma
Ft Tejon
San Francisco
San Diego
Indianola
Brownsville
TRACKS OF CENTRI
PUBLISHI
BRI
AVERAGE PROGRESS OF AREAS OF LOW BAROMETER
EAST OF THE 97TH MERIDIAN.
No. | Velocity.
I. 36 miles per hour.
II. 20 do.
III. 23 do.
IV. — do.
V. 31 do.
VI. 25 do.
VII. 21 do.
VIII. 29 do.
IX. 17 do.

No. I.


NT WEATHER MAP.
IC E. U.S. ARMY.
E BENEFIT OF COMMERCE AND AGRICULTURE.
VIII
IV
IX
II
I
VII
III
V
IX
VI
III
Punta Rasa
Key West
Havana
SANTIAGO
NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:35 A. M., the 4:35 P. M., and 11 P. M. observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and hour, written respectively above and below the line.
OF AREAS OF LOW BAROMETER FOR APRIL, 1877.
BY ORDER OF THE SECRETARY OF WAR.
EN. (BVT. MAJ.) U. S. A.
CHIEF SIGNAL OFFICER, U. S. A.
at Long. West from Greenwich

ceding table is 30.38, while the corresponding average for twelve areas during March was 30.40, showing but a slight change toward the conditions that prevail during the summer.

No. I. Is the same as No. XII of March, and was central over the Gulf of Saint Lawrence on the morning of the 1st. It disappeared in advance of low barometer No. I.

No. II. Followed in the rear of low No. I, and was, on the 2d, at 7.35 a. m., central in Minnesota; on the 3d, 7.35 a. m., over Lake Huron; on the 4th, 7.35 a. m., over the mouth of the Saint Lawrence.

No. III. Followed in the rear of low No. V, and was, on the 6th, at 7.35 a. m., north of Minnesota, whence it moved southeastward, and was, on the 7th, at 7.35 a. m., central over Lake Huron, and during the next 24 hours remained nearly stationary.

No. IV. Followed in the rear of low No. V, and was, on the 9th, at 7.35 a. m., central in Manitoba. During the next 24 hours, while extending southward, the eastward extension was also quite decided, and on the 10th, 7.35 a. m., Nos. IV and III had united north of the Lake region, where cold, brisk northeast winds prevailed, while low area No. V continued near the South Atlantic coast. During the next 24 hours, while the pressure steadily increased in the Gulf States, Ohio Valley, and northwest, the pressure also rose over the Lake region, with northeast winds, showing that here was the southern edge of a very extensive area of high pressure, which continued north of the Lake region until the 13th, 7.35 a. m., while the severe storm No. VI moved eastward over the Gulf States. During the 13th and 14th the pressure diminished over the Canadian stations, and the high pressure remained without definite limits.

No. V. The passage eastward of low barometer No. VI was followed by southerly winds and rising barometer throughout the Gulf States, and the pressure remained high over Florida until the 18th, 7.35 a. m., after which it diminished, with southeast winds, while low No. VII moved eastward over the Ohio Valley.

No. VI. Followed in the rear of low No. VII but preceded No. VIII, and was formed by the flow southward of the intervening region of cool, dry air. It was, on the 21st, at 7.35 a. m., central over Lake Michigan, but extended as a barometric ridge southward to the Gulf. It moved slowly southeastward; on the 23d, at 7.35 a. m., it extended as a ridge from Georgia to the Saint Lawrence Valley; during the rest of this day the pressure rapidly fell at the northern extremity, and what remained was, on the 24th, at 7.35 a. m., central in the East Gulf States.

No. VII. Followed in the rear of low No. VIII, and, on the 24th, at 7.35 a. m., apparently extended as a ridge from Missouri northeastward to Manitobia; on the 25th, at 7.35 a. m., it extended over the Northwest and Lake region, and was central over Lake Michigan; on the 26th, 7.35 a. m., its southeastern extremity had covered the Middle States while the main body remained north of the Lake region, and was re-enforced by an additional rise until low No. IX had reached the Missouri Valley. On the 27th, 7.35 a. m., the area of high pressure evidently extended from the Lake region indefinitely to the northward. During the next 24 hours the pressure very generally fell over the Lakes and northward, but remained rather high over the Saint Lawrence Valley and Manitoba.

No. VIII. Followed in the rear of low No. IX, and appears to have been mainly due to the southeastward flow of dry, cool air over the eastern slope of the Rocky Mountains. It remained during the 29th and 30th central over the Southwest and Western Gulf States extending slowly eastward.

Areas of low pressure.—No. I. The early history of this depression is given in the Weather Review for March as area No. XII. It was central on the 1st of April, at 7.35 a. m., in Western Minnesota, whence it moved nearly due eastward over the Lake region and Canada, and on reaching New England its nearly circular center had changed to a rather long trough trending nearly north and south. The central pressure on the 1st, 7.35 a. m., was 29.28, but on the 2d, 7.35 a. m., 29.92. The storm appears to have been broken up over New England, and was immediately followed by high barometer No. II. A tornado passed over Barry County, Missouri, about 5 p. m. of March 31st; it moved from the southwest to the northeast, and its central portion was seen to be funnel-shaped, twisting spirally upward, and moving forward with great velocity. The central path of destructive winds was about 500 feet wide.

No. II. This depression was central on the 2d, 11 p. m., northwest of Dakota, having been preceded by a depression in Oregon; it moved eastward over the Lake region, being central on the 4th, 7.35 a. m., in Northwestern Wisconsin on the 5th, 7.35 a. m., over Lake Huron. During the rest of this day this depression extended in all directions, and became merged into No. III, which was at that time moving northeastward along the Atlantic coast.

No. III. An extensive area of cool northeasterly winds prevailed on the 3d throughout the Gulf States, Ohio Valley, and Lower Lakes, followed during the afternoon and evening by increasing cloudiness and light rains. Some information in regard to the condition of the atmosphere is furnished by the observations made on the occasion of a balloon ascension at Nashville, the details of which are given in the accompanying diagrams, from which, and other records, it appears that a gentle, moist current, at

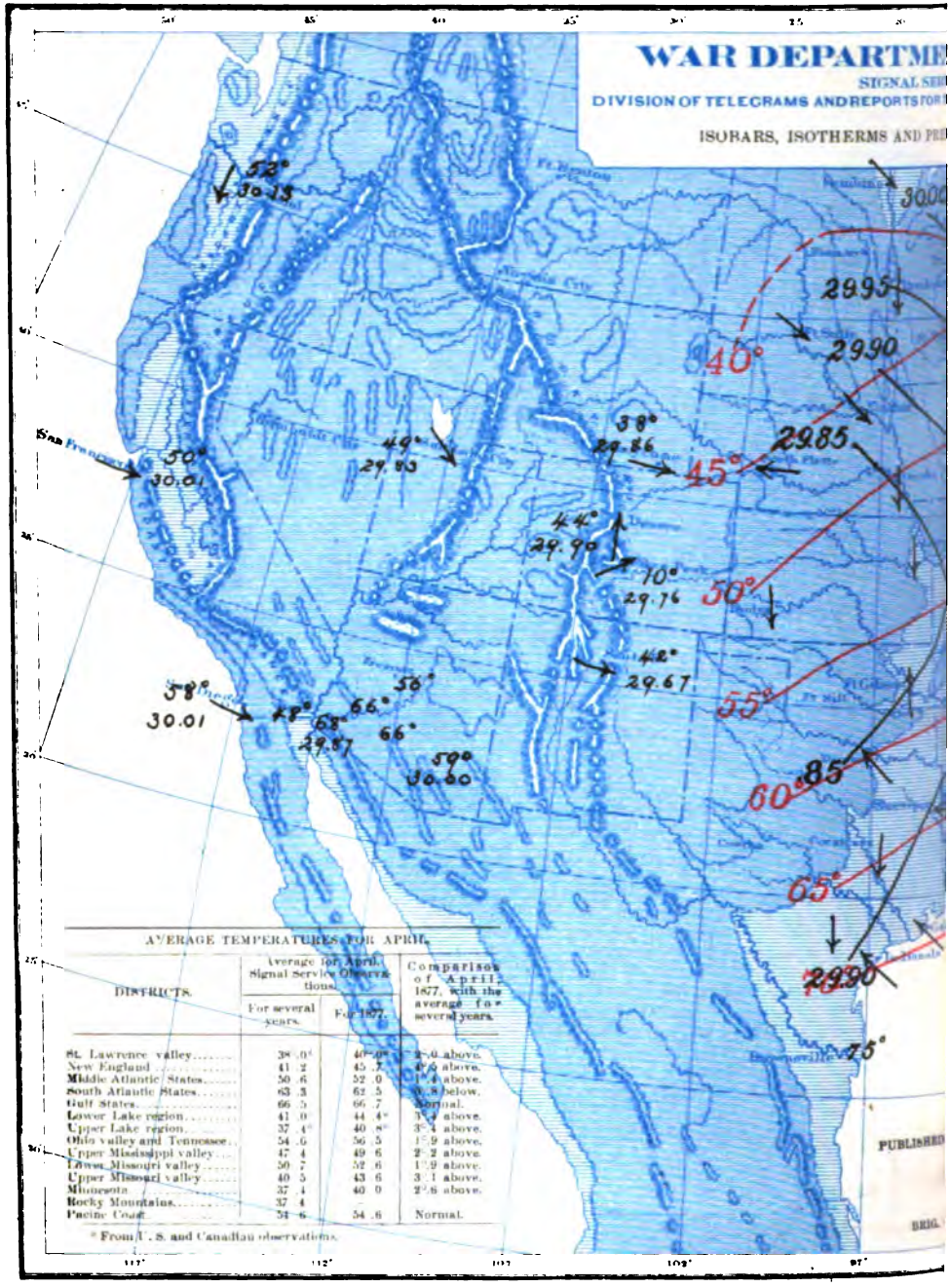
about the rate of four miles per hour from the northeast, prevailed at the earth's surface over all the neighboring region. This current at Nashville prevailed up to altitudes varying between 2,500 and 3,100 feet above sea-level, or 2,000 and 2,600 above the Signal-Service station. At these altitudes the balloon passed into a diametrically opposite cold and dry current, moving at the rate of 20 miles per hour from the southwest. The balloon ascended only about 5,200 feet (barometer 25.50), and the southwest current still existed at that height. Cirro-stratus clouds covered the heavens during the whole ascension, and were always above the balloon; this cloud stratum seems to have steadily increased from a haze in the morning to dense stratus at night, followed by rain at 11 p. m. The direction of its movement was from the southwest, as observed at all the stations in Tennessee and Kentucky. The condition of the atmosphere at different levels is best seen by grouping the observations according to the altitudes at which they are taken. We thus obtain the following numbers:

Stations.	Number of observations	Time.	Barometer.	Thermometer.		Approximate altitude.	Ten. vap.	Dew point.	Relative humidity.
				Dry.	Wet.				
		P. M.	*Inches.*	°	°	*Feet.*	*Inches.*	°	*Pr. ct.*
I. In balloon	10	4.27	25.132	46.55	33.20	4,820	0.0450	— 0.2	13
II. In balloon	6	3.35	27.178	52.08	42.67	2,700	0.1669	+28.6	41
III. In balloon	1	5.21	28.450	51.50	42.5	1,440	0.159	28.9	62
	10	3.39	28.632	55.00	46.00	1,280	0.1805	32.8	44
IV. In balloon { 10 before / 10 after }	20	4.03	29.338	56.10	47.30	620	0.197	36.0	47
V. { Signal-service station, Nashville. }	1	2.00	29.499	55	45	.....	0.168	30	39
	1	3.56	29.462	57	46	504.2	0.166	30	36
	1	9.00	29.416	53	48	.....	0.269	42	67
VI. *Reduced to sea-level	1	3.56	29.990	.....	.....	0	.....	.....	.....

The group II represents the temperature, pressure, &c., prevailing near the upper limit of the lower or warm, moist, gentle northeast current. Group I shows the conditions in the cold, dry, and more rapid southwest current next above; the thickness of this S. W. stratum we have no means of determining further than that the cirro-stratus clouds and haze, that at 5,200 feet were still above the balloon, were moving with it from the southwest, and, therefore, probably formed a part of it.

The general depression thus formed over so large an area was on the 4th, 7.35 a. m., central over Northern Florida, whence the area of lowest pressure moved eastward to the Atlantic coast, after which it turned northeast, being central on the 5th, 7.35 a. m., off Cape Hatteras. During the rest of this day the barometer fell rapidly over New England and the storm-center apparently turned northward in its course, being, at 11 p. m. of the 5th, central near the coast of Maine, where it remained nearly stationary during the night. Its center passed during the 6th very slowly over Maine and New Brunswick, and during the 7th equally slowly over Nova Scotia, east of which province it was central on the 7th, at 11 p. m.

Nos. IV and V. The pressure fell rapidly at Manitoba between 4.35 and 11 p. m. of the 4th, and slightly in Oregon, where the barometer was quite high. The depression in Manitoba was rapidly followed by northwest winds and rising barometer, which latter extended rapidly southward into Kansas, where a new depression (No. V) was formed, during the 5th, between the areas of cold northerly and warm southerly winds. On the 5th, 4.35 p. m., No. IV was central north of the Lake region, while No. V was in Kansas. The former depression was now lost sight of, while the latter rapidly increased, after first moving southward into Texas, where it developed during the 6th and 7th. During the interval the extensive area of high pressure No. III moved southeastward over the Lake region and Middle States, followed by a decided depression, which rapidly stretched southward from Manitoba to Texas during the 7th, and seems to have led the way in the northward movement of area No. V, which was, on the 7th, 4.35 p. m., apparently central in Indian Territory, with a tendency to the formation of a new center about 300 miles to the eastward. At 11 p. m. of the 7th the lowest pressure was central in Mississippi, and undoubtedly represents the eastern division just referred to, whose development was attended by the tornado described further on. Its path is thence northward into Tennessee and eastward to the Carolina coast, where a slight depression existed on the 9th, 7.35 a. m., where the barometer remained low during the rest of the day, while brisk and high northeast winds prevailed along the Middle and East Atlantic coasts, and it seems likely that a well-defined, severe storm was developed at some distance off the coast, and moved northeastward, passing to the east of Nova Scotia at about 11 p. m. of 11th. At 4 p. m. of the 7th, while the center of lowest pres-

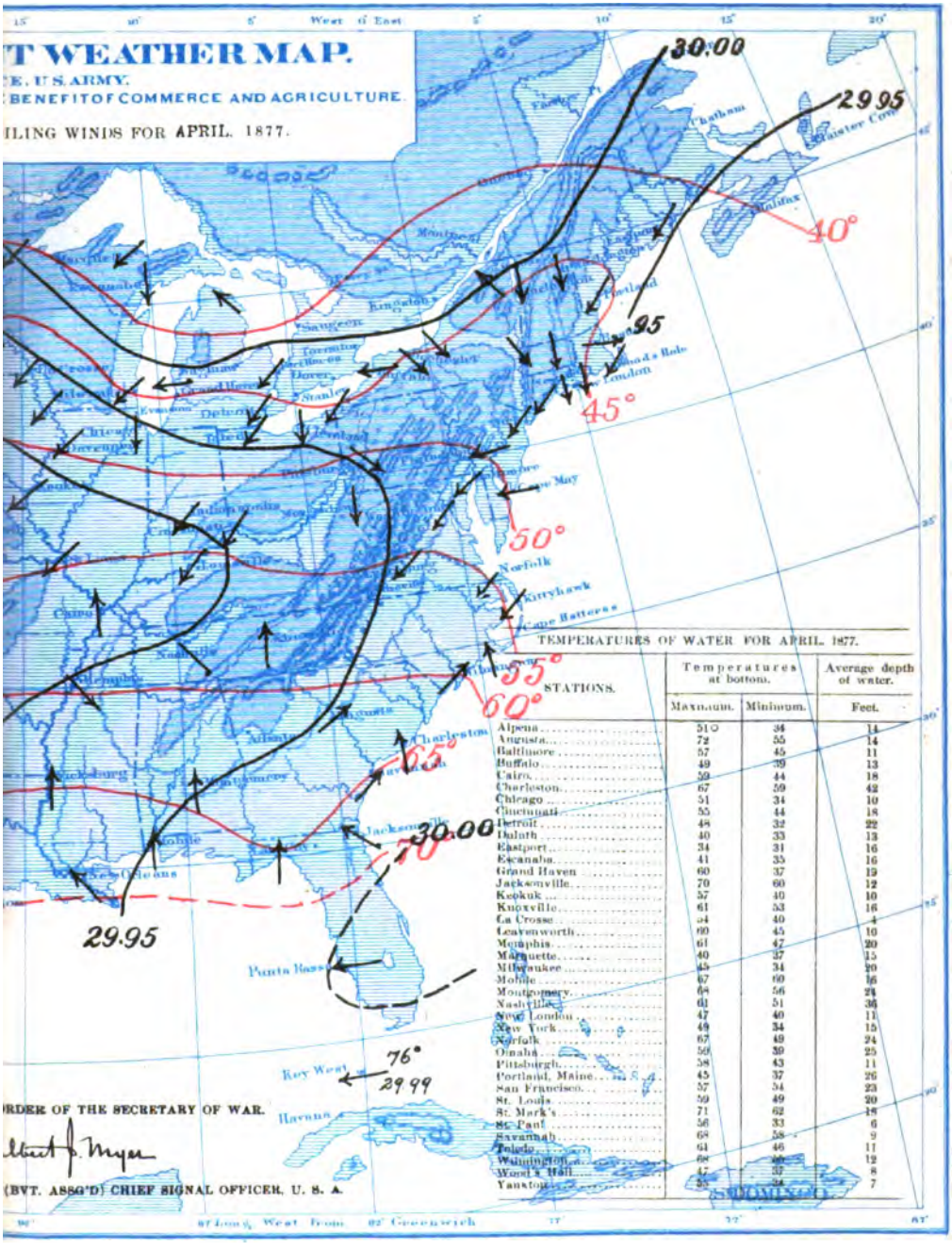


AVERAGE TEMPERATURES FOR APRIL.

DISTRICTS.	Average for April, Signal Service Observations. For several years.	For 1877.	Comparison of April, 1877, with the average for several years.
St. Lawrence valley	38 .0°	40 .0°	2 .0 above.
New England	41 .2	45 .7	4 .5 above.
Middle Atlantic States	50 .6	52 .0	1 .4 above.
South Atlantic States	63 .3	62 .5	0 .8 below.
Gulf States	66 .5	66 .7	Normal.
Lower Lake region	41 .0	44 .4°	3 .4 above.
Upper Lake region	37 .4°	40 .8°	3 .4 above.
Ohio valley and Tennessee	54 .6	56 .5	1 .9 above.
Upper Mississippi valley	47 .4	49 .6	2 .2 above.
Lower Missouri valley	50 .7	52 .6	1 .9 above.
Upper Missouri valley	40 .5	43 .6	3 .1 above.
Minnesota	37 .4	40 .0	2 .6 above.
Rocky Mountains	37 .4		
Pacific Coast	54 .6	54 .6	Normal.

* From U. S. and Canadian observations.

No. II.



TEMPERATURES OF WATER FOR APRIL, 1877.

STATIONS.	Temperatures at bottom.		Average depth of water.
	Maximum.	Minimum.	Feet.
Alpena	51	36	14
Augusta	72	55	14
Baltimore	57	45	11
Buffalo	49	39	13
Cairo	59	44	18
Charleston	67	59	42
Chicago	51	34	19
Cincinnati	55	44	18
Detroit	48	32	22
Duluth	40	33	13
Eastport	34	31	16
Escanaba	41	35	16
Grand Haven	60	37	19
Jacksonville	70	60	12
Keokuk	57	40	10
Knoxville	61	53	16
La Crosse	54	40	4
Leavenworth	60	45	10
Memphis	61	47	20
Marquette	40	37	15
Milwaukee	45	34	20
Mobile	67	60	16
Montgomery	68	56	24
Nashville	61	51	36
New London	47	40	11
New York	49	34	15
Norfolk	67	49	24
Omaha	56	39	25
Pittsburgh	58	43	11
Portland, Maine	45	37	26
San Francisco	57	54	23
St. Louis	59	49	20
St. Mark's	71	62	18
St. Paul	56	33	6
Savannah	68	58	9
Toledo	61	46	11
Wilmington	68	60	12
Wood's Hall	47	32	8
Yanston	55	34	7

sure was in Indian Territory, a severe tornado passed over De Soto County, Louisiana. Later in the night another tornado passed northward over Pensacola, Fla., into Alabama, developing rapidly into a new area of low pressure. The destruction of property and life at Pensacola was severely felt; this storm began, with a strong southeast wind, at 2 p. m.; at 9 a. m. a very heavy rain began, partially ceasing at midnight; between 3 and 4 a. m. of the 8th the wind veered suddenly to a violent southwest gale, lasting only five minutes, but doing much damage. While the area of lowest pressure continued, during the 8th, west of the Blue Ridge Mountains, the southward flow of air along the Atlantic coast produced violent gales on the North Carolina coast. At Cape Henry a wind of 65 miles per hour prevailed for 38 hours, and thence to Cape Hatteras the storm is described as one of rare severity during the 8th and 9th. The schooner Clara E. Bergen, from Charleston for New York, encountered the gale of the 8th and hurricane of the 9th and 10th off Cape Hatteras, experiencing the highest winds at 8 a. m. of the 10th. The winds were from east-northeast to southeast.

No. VI.—The barometer began to fall in California on the 9th, and was lowest on the 10th, at 4.35 p. m. The subsequent depression at the Rocky Mountain stations continued into the 11th, the pressure being lowest at Santa Fé at 7.35 a. m. An area of low pressure was developed in Texas between the 11th, 4.35 p. m., and 12th, 7.35 a. m., and was, at the latter date, central in Western Louisiana, but extended as a trough southeastward to Panama, where the pressure was 29.81, while it was about 29.70 at Aspinwall and 29.50 at Vera Cruz. By this time high northerly winds had swept down over Texas, and southeast winds, with rain, prevailed in the Eastern Gulf States. The area of lowest pressure moved thence southeastward into the Gulf of Mexico and then turning northeastward passed over Georgia to the coast of South Carolina. It was, on the 13th, at 11 p. m., central some distance east of the coast, whence it moved to the east-northeast beyond our stations. The United States steamer Powhatan was, at 7.35, 14th, near its center, with barometer 29.25, and a north-northeast hurricane, being in latitude 34° 20′, longitude 76° 25′. In its passage over the South Atlantic States this storm developed into one of hurricane violence, and is described as such by vessels encountering it on the ocean. At Charleston, on April 13th, the wind increased from 2 a. m. to 5 a. m., when it had attained 36 miles per hour, and to a maximum, at 8 a. m., of 55 miles from northeast. This wind-velocity and the rain-fall of 6 inches between 3.30 and 8.20 a. m. has not been equaled before since the establishment of the Charleston station. The steamship Gulf Stream left Charleston April 12, 5.40 a. m., for New York. On Friday, April 13, 4.30 a. m., when off Cape Lookout Shoals, the wind having become dangerous, the vessel steamed eastward; by 5 p. m. the wind had increased to a full hurricane-velocity from the northeast, and the vessel, being about 100 miles off the coast, scudded before the wind, receiving also considerable damage. The barometer continued at 29.30 and less from 5 p. m. of 13th to 2 a. m. of the 14th, when the barometer had passed its lowest reading; the wind seems to have been due northeast. The steamers G. W. Clyde, from New York to Charleston, and General Barnes, from Savannah for New York, encountered the same storm in about the same location.

No. VII.—The barometer fell rapidly during the 13th and 14th in Oregon, and a considerable depression was on the 14th, 4.35 p. m., apparently central in Manitoba, whence it extended southward without any definite existence as a storm-center until the 16th, 4.35 p. m., by which time the pressure had begun to rise rapidly in Manitoba and Oregon, and the area of lowest barometer was probably central in Southern Dakota. After moving southward into Nebraska and thence eastward to Iowa, the depression then began to extend north and south into an oval, which on the 18th was again contracted into a well-defined storm center, which was, at 11 p. m. of 18th, central, with a very low pressure, in Western Missouri; tornadoes passed from Missouri eastward into Tennessee this night, and are reported from Union City, La Vergne, and Viola, Tenn., and Holly Springs, Miss. At this time the area of southwest winds and cloud or rain extended over the Eastern Gulf and South Atlantic States; southeast winds and rain in the Ohio Valley and portions of the Missouri Valley; northeast winds with rain over the Middle and Eastern States, Lake region, and Upper Mississippi Valley. These weather conditions continued during the night and greater part of the 19th, while the lowest pressure moved slowly eastward into the Ohio Valley, where it was central on the 19th at 11 p. m. The lowest isobars then began to stretch as a barometric trough along the line of the Alleghanies. On the 20th, at 4.35 p. m., the lowest pressure was central in Massachusetts, whence it moved northeastward along the coast of Maine, and disappeared over the Gulf of Saint Lawrence on the morning of the 21st. At Saint John, New Brunswick, on the 20th, a severe east gale prevailed in the early morning, proving very destructive to the shipping in the harbor.

No. VIII.—This depression follows immediately in the rear of high barometer No. VI, and is first well located on the 21st, 4.35 p. m., as a very long oval, trending north and south through Dakota and Manitoba. The northwest winds in its rear closed in upon it by 4.35 p. m. of the 22d, at which date an oval, central in Northeastern Nebraska represents what there was left of the original depression. This oval seems to have at once begun a rapid movement northeastward, and disappeared on the 23d, 4.35 p. m.

north of Lake Superior; meanwhile the cold northerly winds in their progress southward gave rise to a second depression in Western Texas, which became merged into No. IX.

No. IX.—This depression appears to have originated in the precipitation that took place at the southwestern stations on the 24th. During this day the pressure fell on the Pacific coast and at all the Rocky Mountains stations, and an area of high pressure consequently moved southward over the Lake region and the Northwest, while southeasterly winds prevailed in the Gulf States. The area of precipitation extended during the 25th, northward into Wyoming Territory and Nebraska, and on the 26th into Dakota, while the pressure continually fell in the Southwest, but rose north of Illinois and Iowa. On the 26th, 4.35 p. m., the lowest pressure was central in the southwestern part of Indian Territory, and severe hail-storms, with winds of tornado-violence, occurred in Red River and Travis Counties, Texas, during the evening. The storm-center moved thence eastward and northward, and was on the 27th, at 4.35 p. m., central from the southwestern corner of Nebraska to Saint Louis along the Missouri Valley. The axis of the oval, which at this time trended east and west, so continued during the 28th, while the area of lowest pressure moved eastward into Ohio and thence northeast over the Lower Lake region. During the 29th two areas were formed, which were central at 4.35 p. m., respectively, in Northern Michigan and Pennsylvania; the latter moved south eastward to the Atlantic coast, and pressure remained very generally low over the Middle and Eastern States and Lower Lakes, with cloudy and rainy weather, but without any well-defined lowest pressure during the 29th and 30th.

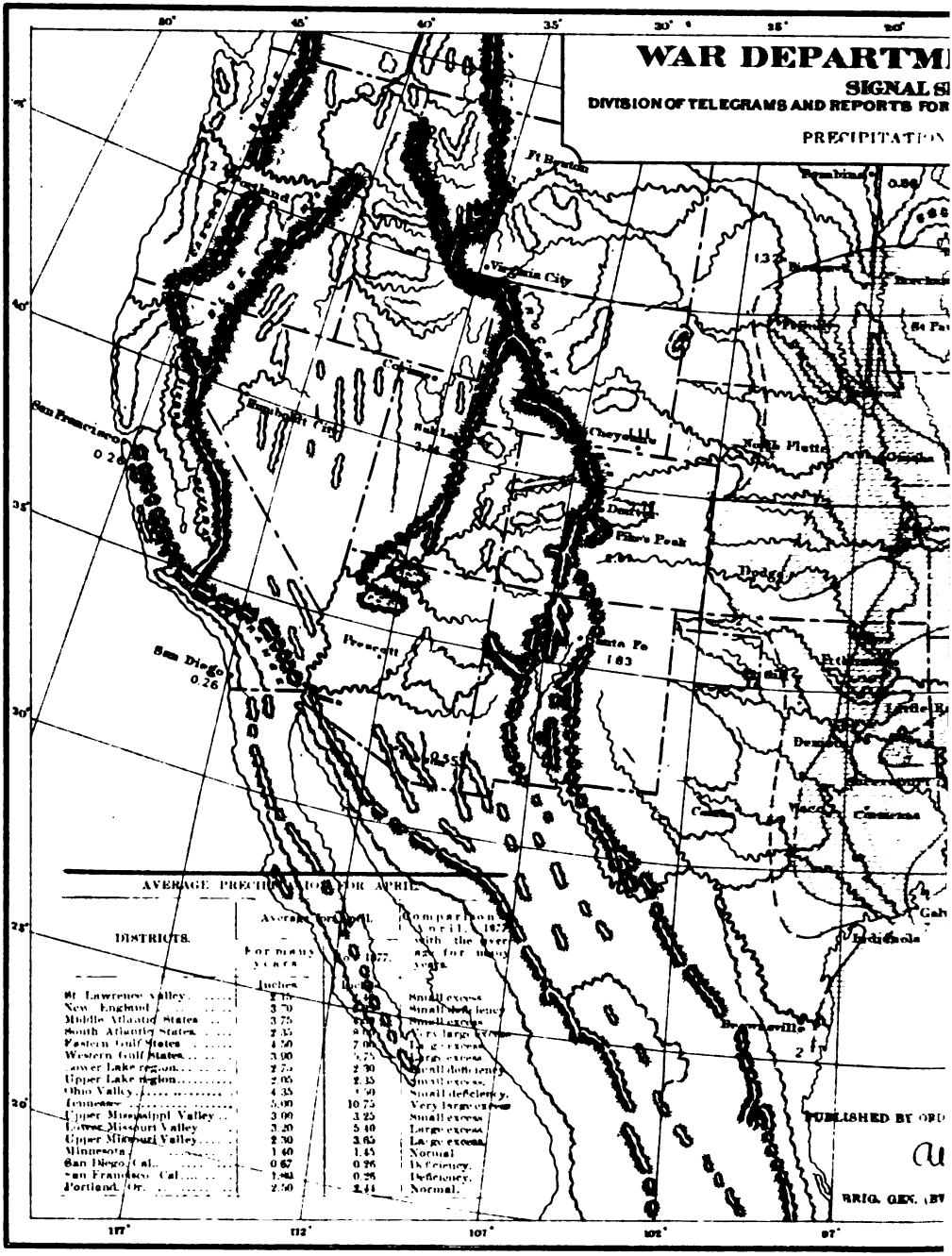
Vessels experiencing storms at sea.—Besides the almost continuous gales that prevailed off the coast of the Carolinas and Virginia from the 5th to the 14th, the following notes relating to more distant storms have been received: On the 6th, latitude 29° 40′ north, longitude 68° 00′ west, heavy southeast to northeast gale; 9th, 27° 21′, 75° 03′, heavy east-northeast to north-northeast gale; 9th to 13th, latitude 27° to 37°, longitude 73° to 76°, heavy gale; 10th, latitude 35° to 34°, longitude 71°, southeast gale backing to northeast; 11th, latitude 34°, longitude 42°, strong west gale; 12th, off coast of Cuba, severe southeast gale; 13th, latitude 42° 13′, long 62° 04′ strong northwest to north gale; 13th to 15th, latitude 24° north, longitude 73° west, heavy west-northwest to west-northwest gale; 18th, latitude 36°, longitude 67°, heavy southwest gale.

TEMPERATURE OF THE AIR.

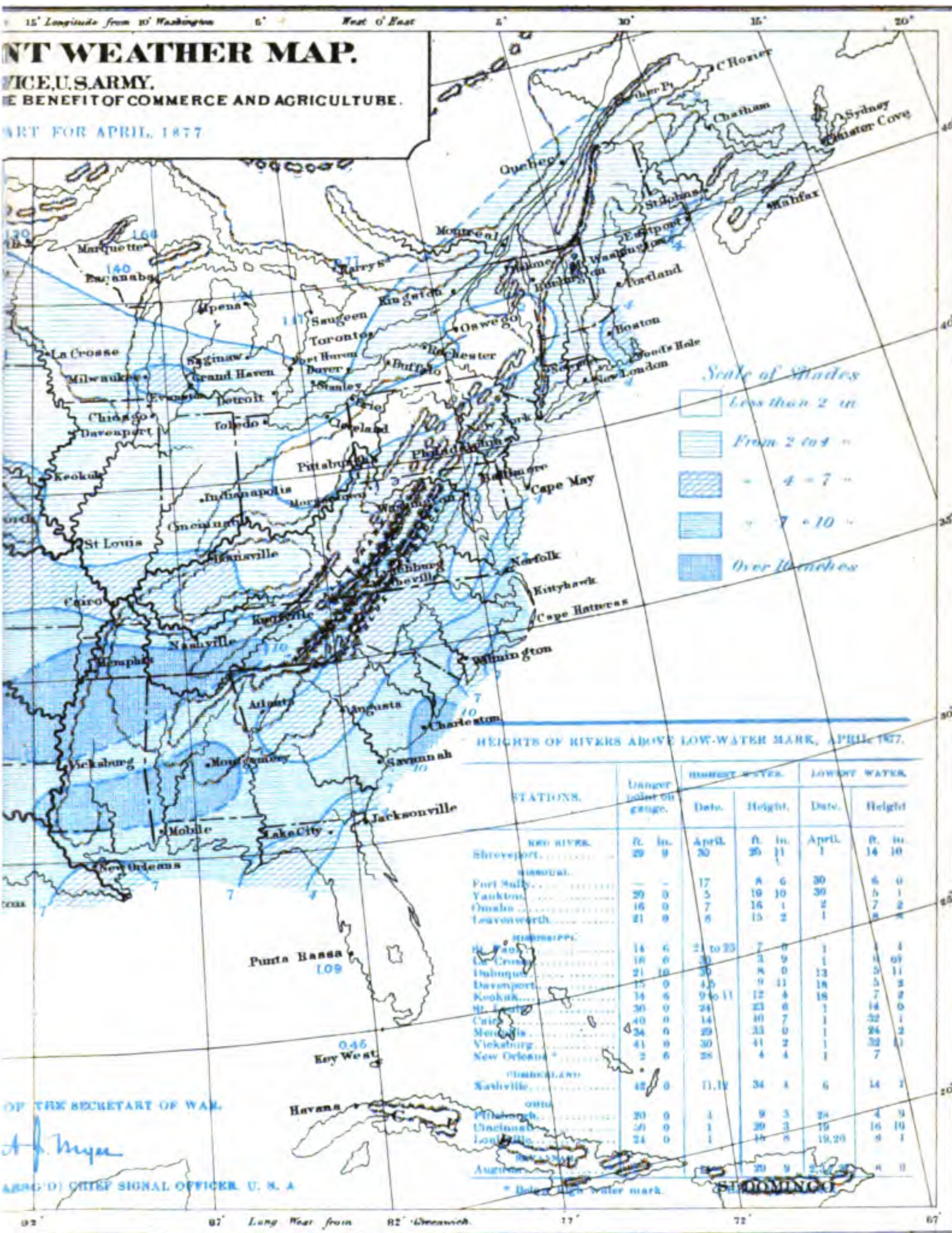
The general distribution of temperature is shown by the isotherms on Chart No. II. The comparison with the mean temperatures observed at Signal-Service stations since 1870 is given in the small table upon the same chart, and shows temperatures above the average, excepting in the South Atlantic and Gulf States. The isotherm of 70° passes from Indianola, Tex., to the northern portion of the peninsula of Florida; its course is the same as in April, 1876, but is 3° north of its position in April, 1875, and 2° to 3° north of its position in April, 1874; the isotherm of 40° passes through Bismarck, Duluth, Lake Huron, Quebec, Halifax, and its course is the same as in April, 1876, but is 5° north of its position in April, 1875, and 5° to 7° north of its position in April, 1874. The following monthly means have been received since the chart was printed: Pembina, 33°.1; Virginia City, 36°.5; Fort Sully, 44°.7, and Cape Hatteras, 55°.2.

Maximum and minimum temperatures.—The *maxima* above 80° were: 91° at Indianola, on the 7th. 88° Boerne, 4th. 87° San Antonio, 4th and 7th. 86° Tybee Island, 25th. 85° Augusta, 24th and 25th; Charleston, 24th; Jacksonville and Savannah, 20th; Wilmington, 24th. 84° Corsicana, 21st; Lynchburg, 24th. 83° Fort Gibson, 5th; Knoxville, 24th; Mobile, 28th; Norfolk and Shreveport, 6th. 82° Galveston, 20th; Louisville, 23d; Montgomery, 25th; Saint Mark's 22d; Washington, 24th. 81° Denison, 7th; Marquette and New York, 24th; Saint Louis, 23d; Vicksburg, 22d. The *maxima* below 70° were: 68° at Barnegat, 25th; Wood's Holl, 24th. 66° Bismarck, 30th. 67° Breckenridge, 21st; Cheyenne, 20th; Santa Fé, 15th. 64° Buffalo, 23d. 63° Duluth, 25th; Eastport, 23d and 27th; Thatcher's Island, 26th. 61° Alpena, 20th and 22d; Escanaba, 23d. 49° Mount Washington, 24th. 26° Pike's Peak, 26th. The *minima* above 40° were: 42° at Augusta, 12th and 15th; Corsicana, 2d: Savannah, 14th. 43° Charleston, 10th; Tybee Island, 14th. 45° Jacksonville and Saint Mark's, 15th. 46° Montgomery, 5th. 47° San Antonio, ——. 48° Shreveport, 2d. 49° Mobile, 14th; Vicksburg, 3d. 54° Galveston, 24th. 55° Indianola, 30th; New Orleans, 13th and 15th. The *minima* below 10° were: 9° at Cheyenne, 29th; Saint Paul, 2d. 5° Duluth, 2d; Mount Washington, 7th and 12th. 3° Breckenridge, 1st. 2° Bismarck, 2d. — 8° Pike's Peak, 29th.

Ranges of temperature.—The largest *diurnal* ranges are as follows: 40° at Denver, 30th. 41° Boerne, 20th. 42° Leavenworth, 5th. 38° Cheyenne, 29th; Dodge City, 6th; Morgantown, 16th; Yankton, 22d. 39° Fort Gibson, 5th; Lynchburg, 24th; Marquette, —. The largest *monthly* ranges are: 60° at Denver; 61° La Crosse: 64° Bismarck, Breckenridge, and Saint Paul; 69° Marquette. The smallest *monthly* ranges


WAR DEPARTM
SIGNAL S
DIVISION OF TELEGRAMS AND REPORTS FOR
PRECIPITATION
Ft Benton
Virginia City
Cheyenne
North Platte
Pikes Peak
Denver
Santa Fe
183
Prescott
San Francisco
0.26
San Diego
0.26
Bismarck
0.86
Brownsville
Galveston
Indianola
PUBLISHED BY ORD
BRIG. GEN. (BY
AVERAGE PRECIPITATION FOR APRIL.
DISTRICTS.
Average for April.
For many years.
Inches.
St. Lawrence Valley 2.75
New England 3.70
Middle Atlantic States 3.75
South Atlantic States 2.35
Eastern Gulf States 4.50
Western Gulf States 3.90
Lower Lake region 2.75
Upper Lake region 2.05
Ohio Valley 4.35
Tennessee 5.00
Upper Mississippi Valley 3.00
Lower Missouri Valley 3.20
Upper Missouri Valley 2.30
Minnesota 1.40
San Diego, Cal. 0.67
San Francisco, Cal. 1.83
Portland, Or. 2.50
Comparison with the average for many years.
Small excess
Small deficiency
Small excess
Very large excess
Large excess
Small deficiency
Small excess
Small deficiency
Very large excess
Small excess
Large excess
Large excess
Normal
Deficiency.
Deficiency.
Normal.
80°
45°
40°
35°
30°
25°
20°
117°
112°
107°
102°
97°
45°
40°
35°
30°
25°
20°

No. 111.



HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, APRIL, 1877.

STATIONS.	Danger point on gauge.		Highest water. Date.	Highest water. Height.		Lowest water. Date.	Lowest water. Height.	
	ft.	in.	April.	ft.	in.	April.	ft.	in.
RED RIVER.								
Shreveport	29	9	30	25	11	1	14	10
MISSOURI.								
Fort Sully	—	—	17	8	6	30	6	0
Yankton	20	0	5	19	10	30	5	1
Omaha	16	0	7	16	1	2	7	2
Leavenworth	21	0	8	15	2	1	8	[illegible]
MISSISSIPPI.								
St. Paul	14	6	21 to 23	7	0	1	[illegible]	4
La Crosse	18	0	30	3	9	1	[illegible]	[illegible]
Dubuque	21	10	30	8	0	13	5	11
Davenport	15	0	4,5	9	11	18	5	2
Keokuk	14	6	9 to 11	12	4	18	7	2
St. Louis	30	0	24	23	6	1	14	0
Cairo	40	0	14	40	7	1	32	1
Memphis	34	0	29	33	0	1	24	2
Vicksburg	41	0	30	41	2	1	32	[illegible]
New Orleans *	2	6	28	4	4	1	7	
CUMBERLAND.								
Nashville	42	0	11,12	34	4	6	14	[illegible]
OHIO.								
Pittsburgh	20	0	1	9	3	28	4	9
Cincinnati	50	0	1	39	3	19	16	10
Louisville	24	0	1	16	8	19,20	8	1
SAVANNAH.								
Augusta	[illegible]	[illegible]	[illegible]	20	9	2,3 [illegible]	8	0

* Below high-water mark.

ure: 33° at Thatcher's Island; 34° Mobile and Pike's Peak; 35° Eastport and Shreveport; 36° Barnegat, Cape Lookout, Indianaola, Montgomery, and Wood's Holl; 25° New Orleans; 28° Galveston; 32° Vicksburg.

Frost.—On the 2d, in Illinois, Tennessee; 3d, Illinois, Maryland, Virginia; 7th Maryland; 10th Arkansas, North Carolina, Texas, Utah; 11th, Maryland, North Carolina, Virginia; 13th Virginia; 14th, Arkansas, Virginia; 15th, Maryland, North Carolina, South Carolina, Virginia; 16th, North Carolina; 25th Iowa; 26th, New York; 29th, Illinois, Indian Territory; 30th, Kansas, Arkansas, Illinois, Indiana, Nebraska, Tennessee, Indian Territory, Missouri.

Ice.—The occurrence of cold, dry nights, marked by the formation of ice rather than frost, is noted on the following dates: 4th, Utah; 9th, Utah; 11th, Virginia; 12th, North Carolina; 18th, 19th, 20th, 21st, 22d, 23d, Utah; 24th, Iowa, Utah; 27th and 28th, Utah; 29th, Kansas, Nebraska; 30th, Illinois, Kansas, Nebraska.

PRECIPITATION.

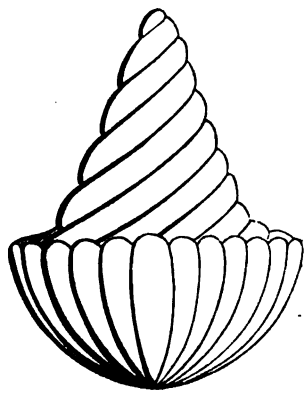
The general distribution of rain and snow is shown upon Chart No. III, from which it will be seen that the region of largest rain-fall covers Tennessee and the Central Gulf States, with small areas of large rain-fall on the immediate South Atlantic coast. This latter feature is wanting in the rain-falls of 1874, '75, '76. An area of largest excess of rain over normal values is shown by the table on same chart to have been especially marked in the South Atlantic States and Tennessee, over which regions the precipitation has been two or three times its average value. A region of large rain-fall is also well marked throughout the Missouri Valley.

Small monthly precipitations.—The total amount of rain and melted snow has been less than 0.5 inch at the following stations: Key West, 0.16; San Diego and San Francisco, 0.26; Maricopa Wells, 0.03; Wickenburg, 0.45; Brownsville, 0.13; Stockton, 0.09; Fort Bridger, Wyo., 0.34; Camp McDermot, Nev., 0.20.

Large monthly precipitations.—The total amount of rain and melted snow has been 10 inches, or more, at the following stations: Cape Lookout, 10.65; Charleston, 15.00; Memphis, 13.90; Montgomery, 10.36; Carlowville, Ala., 15.10; Fayette, Miss., 10.30; Brookhaven, Miss., 12.00; Austin, Tenn., 10.70; Clarksville, Tex., 10.25.

Largest special rains or snows.—Among the large special rains are the following: Vicksburg, 7th, 3.36; Fort Sully, 16th and 17th, 3.01; Denver, snow, 27th, 16 inches; Cape Lookout, 13th and 14th, 5.80; Charleston, 8th, 4.06, 13th, 8.30; Denison, 25th and 26th, 3.70; Green Springs, Ala., 7th, 4.75; Fort Gibson, 6th and 7th, 4.60; Galveston, 23d, 24th, and 25th, 6.62; Grand Haven, 18th and 19th, 3.11; Leavenworth, 16th to 19th, 4.95; Memphis, 17th to 19th, 3.06; 24th to 27th, 4.43; Milwaukee, 18th and 19th, 4.55; Montgomery, 7th and 8th, 4.79; 27th and 28th, 3.01; Norfolk, 9th and 10th, 5.13; Genoa, Nebr., 26th, 27th, and 28th, 6 inches snow.

Hail-storms.—Besides numerous light hail-storms, severe ones are reported at Fort Larned, Kans., on the 22d; Clarksville, Tex., 7th and 26th; Vicksburg, 7th; Austin, Texas, 26th. Morgantown, W. Va., on the 28th, from 5.15 to 5.19 p. m., occurred a fall of remarkably large hail; the largest hail measured 2 inches longest diameter and 1½ inches shortest; for two minutes preceding these large hail a smaller size fell, and for six minutes preceding, or beginning at five hours seven minutes, rain fell; the fall began with the wind southeast, brisk, backing to northwest at 5.26, and to west at 5.45; the smaller-sized hail were generally round, with a nucleus of ice; of the largest size about one-half had an ice nucleus, the remainder were composed of ice and snow. "A very noticeable feature on the larger stones was that when held in front, with the cone upward, a twist or curve proceeded from the shoulders of the hail-stone to the top of the cone from left to right" (see the accompanying figure). The total precipitation during the storm was about 0.87 inch. "Fifteen of the largest hail-stones were collected and melted, and gave 0.26 inch water in the gauge," which is equivalent to an average cubic contents for each hail-stone of 0.873 cubic inche.



Monthly snow-fall.—The depth of snow-fall has been reported as follows: Golden, Colo., 43.4 inches; Iowa, 4 to 12; Maine, 2 to 3; Massachusetts, 2 to 3; Michigan, 3 to 4; Nebraska, 2 to 6; New Haven, 1 to 3; New York, 0.5; Vermont, 1 to 7; Virginia, 0.5; Wisconsin, 4 to 10.

Depth of snow on ground at close of month.—Iowa, 6 inches.

Rainy days.—The number of days in which appreciable rain fell have averaged about as follows: New England coast and Middle Atlantic stations, 10 to 17; South Atlan-

tic coast, 10 to 15; Gulf States, 9 to 16; Tennessee and the Ohio Valley, 10 to 19; Lower Lake region, 8 to 14; Interior of New England, 7 to 10; Upper Lake region, 7 to 13; Upper Mississippi Valley, 9 to 13; Lower Missouri Valley, 14 to 19.

Cloudy days.—The number of days on which the cloudiness has averaged eight-tenths or more, as reported principally by voluntary observers, is as follows: New England, Middle Atlantic and South Atlantic States, Gulf States, Tennessee and Ohio Valley, 7 to 16; Lake region, 11 to 17; Northwest, 6 to 13.

RELATIVE HUMIDITY.

The relative humidity averages on the coast of New England, 66 per cent.; Middle Atlantic States, 69; South Atlantic States, 71; Gulf States, 70; Tennessee and the Ohio Valley, 63; Upper Mississippi Valley, 62; Lower Missouri Valley, 64; Upper Lake region, 67; Lower Lake region, 64; San Francisco, 68. At high stations, the averages uncorrected for the low pressures are Salt Lake City, 43; Santa Fé, 40; Pike's Peak, 87; Denver, 51; Cheyenne, 65; Mount Washington, 64.

WINDS.

Prevailing winds are shown by the arrows upon Chart No. II. A somewhat unusual prevalence of northeast winds is reported from most stations east of the Rocky Mountains, in which respect the past April offers a striking contrast to April of 1875 and 1876, and accords more nearly with April, 1874. Westerly winds have prevailed as usual at the Rocky Mountain and Pacific coast stations, but east of the Rocky Mountains they are reported only from Pembina, Fort Sully, Yankton, and Memphis, northwest, Wilmington, southwest, at Pike's Peak, southwest, and at Mount Washington, north.

Total movements.—The largest total movements for the month are: Breckenridge, 10,080 miles; Cape May, 11,175; Cape Lookout, 12,734; Dodge City, 12,733; Indianola, 11,117; Kittyhawk, 12,118; Pike's Peak, 14,341; Sandy Hook, 10,029. The smallest movements are: Augusta, 3,817; Lynchburg, 3,006; Nashville, 3,376; Baltimore, 4,264. Burlington, 4,361; Montgomery, 4,391; Shreveport, 4,327; Springfield, 4,375.

Highest winds.—Wind-velocities of 50 miles or over are reported from Signal Service stations as follows: Atlantic City, 9th, northeast, 50; Breckenridge, 21st, north, 57; Cape Henry, ——, —, 75; Cape Lookout, 10th, north, 68, 14th, north, 80 (the total movement was about 2,500 miles in forty-eight hours), 28th, southwest, 56; Charleston, ——, —, 55; Denver, 18th, —, 60, Dodge City, 21st and 27th, —, 60; Galveston, 24th, north, 72; Pike's Peak, 21st and 22d, —, 84; Smithville, 13th and 28th, —, 50; Toledo, ——, —, 58; Yankton, 1st, —, 56; Mount Washington, 6th, —, 96; San Diego, west, 75.

Local storms, tornadoes, &c.—Local storms are reported as follows: On the 1st, at Pembina, Dak., a severe "blizzard" occurred, consisting of a northerly gale, with drifting snow and very low temperature, followed by clear, cold weather. On the 10th, at Santa Fé, a northeast gale occurred, and a severe snow-storm, impeding travel. On the 18th a tornado was reported in Southern Kansas, while at the Signal Service station at Leavenworth the barometer fell to 29.11, with high winds and heavy rains. On the same date tornadoes were reported in Missouri and Central Tennessee. It is probable that these tornadoes were distinct from each other—their connection with storm No. VII is mentioned on a preceding page. At Fort Lyon, Colo., there prevailed, during the day, a violent wind-storm from the north. On the 22d the observer at Dodge City reports that, at 5.30 p. m., a strong whirlwind was seen approaching from the southwest; the clouds above had also a rapid whirling motion; on reaching the river a water-spout was immediately formed, shooting rapidly upward, with a sinuous motion, estimated to be about 600 feet high, with a diameter at base of 8 feet. At 5.45 p. m. the wind chopped around to the north, with heavy hail. On the 24th Galveston was visited, at 5.40 a. m., by a terrific thunder and wind storm, accompanied by heavy hail, attending low barometer No. IX. The wind, which was from the north, attained a velocity of 72 miles within five minutes of the commencement of the blow. A series of gales and local storms occurred in this neighborhood from the 23d to the 29th. On the 26th a violent rain-storm occurred at Memphis, and severe local storms in Indian Territory and Texas.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily weather "indications" with the telegraphic weather reports for the succeeding twenty-four hours shows a percentage of omissions 0.6. The general average percentage is 85.7 per cent. Out of 3,580 predictions, 2,640, or 73.7 per cent., have been fully verified; 236, or 6.6 per cent., have been three-fourths verified; 459, or 12.8 per cent., have been half verified; 86, or 2.4 per cent., have been one-fourth verified; 159, or 4.4 per cent., have failed. The percentages for the four elements have been: weather, 91.6; wind, 85.3; temperature, 82.6; barometer, 83.3. The percentages by geographical districts have been: New England, 82.3; Middle Atlantic States, 84.8; South Atlantic States, 86.1; East Gulf

States, 86.4; West Gulf States, 88.0; Lower Lakes, 85.8; Upper Lakes, 86.1; Tennessee and Ohio Valley, 88.1; Upper Mississippi Valley, 84.9; Lower Missouri Valley, 85.0.

Cautionary signals.—During the month 156 cautionary signals have been ordered for stations on the Gulf and Atlantic coasts and the lakes. Of these, 117, or 75 per cent., were justified by subsequent high winds within one hundred miles of the station where they were displayed, and 39, or 25 per cent., were not justified so far as known. Seventy-one instances of high winds, when no signals were displayed, have also been reported from these stations during the month. Telegraphic communication with Cape Lookout was interrupted during the entire month.

NAVIGATION.

Stage of water.—In the table on Chart No. III is shown the highest and lowest readings of river-gauges, with the respective dates. At the close of the month the Red River and the Lower Mississippi were from 8 to 11 feet higher than at the beginning. The Upper Mississippi was 3 feet higher. The Upper Missouri was several feet lower. At other river-stations the water has fluctuated irregularly during the month.

Opening of navigation.—The following reports have been received relative to ice in rivers and harbors and the opening of navigation: Duluth, first boat left 29th. Chicago, 3d, ice disappeared from harbor. Milwaukee, 25th, first vessel arrived from the Lower Lakes, being five days out from Cleveland. Marquette, 15th, ice in bay. Escanaba, 18th, ice moving out of Green Bay: 21st, ice moved from docks. Ice clearing out of the Straits of Mackinaw, 13th. Alpena, 20th, first vessel arrived. Northport, Mich., 20th, ice left harbor; 22d, first boat. Port Huron, 23d, first steamer arrived from Detroit, but much ice remained, and on the 30th forty vessels were still ice-bound. Detroit, 12th, navigation opened, first vessel arrived. Toledo, 19th, first boat arrived from Alpena; 22d, first vessel left. Cleveland, 10th, navigation open to Detroit. Erie, 21st, navigation opened; lake clear of ice 24th. Buffalo, 7th, harbor free from ice, and first vessel left 14th; on 27th, first vessel arrived from Toledo. Rochester, 6th, first vessel arrived. Oswego, 19th, first vessel arrived. Bismarck, 1st, ice-gorge; 10th, navigation opened. Omaha, 6th, floating ice. Saint Paul, 2d, ice moving down in large quantities; 16th, navigation opened. Moorhead, Minn., 7th, Red River of the North began rising; 15th, ice moving; 20th, first boat arrived. Pembina, 18th, ice breaking; 23d, first steamer arrived. West Waterville, Me., 17th, ice cleared from Snow pond. Lake Village, N. H., 22d, ice went out of Lake Winnepisseogee. West Charlotte, Vt., 2d, Lake Champlain clear of ice. Lunenburg, Vt., 10th, ice went out of Connecticut River. Geneva, Wis., 12th, Geneva Lake clear of ice. Neillsville, Wis., 3d, ice broke up in Black River; 22d, river clear. Norfolk, Va., 9th, highest water since 1846. Charleston and Savannah, 13th, were flooded by high tide. Indianola, 24th and 25th, town flooded by high tide.

TEMPERATURE OF WATER.

The temperature of the water is shown by the table on Chart No. II. It will be noticed that along the Atlantic coast the temperatures have increased very uniformly from 34° to 31° at Eastport to 81° and 69° at Key West. On the Gulf coast they have ranged from 60° to 71°. On the Lakes, the somewhat abnormal maxima of 60° and 61° are reported at Grand Haven and Toledo, but for the rest of the lake stations the range is from 33° to 51°. The average temperature for the Upper Lakes is apparently 1° or 2° lower than for the Lower Lakes.

River temperatures.—In the Missouri, temperatures from 34° to 60°; in the Ohio, from 43° to 58°; in the Tennessee and Cumberland Rivers, 53° to 61°; in the Mississippi, 33° to 61°.

Ocean water, temperatures, and densities.—According to the meteorological observations made on board of the Pacific mail steamship Alaska on her voyage from San Francisco to Yokohama, November 1 to 30, 1876, the specific gravity, reduced to a uniform temperature of 60°, of the water observed at noon each day, at 18½ feet below the surface, was as follows: 4, from November 1 at San Francisco to the 12th at longitude 160° west of Greenwich; 5, from November 13 at longitude 163° west to November 17 at longitude 177½° west; 4.5, November 19 longitude 179 east to November 21 longitude 174 east; 5, November 22 longitude 170° east to November 30 at Yokohama longitude 140°.

ATMOSPHERIC ELECTRICITY.

Thunder-storms occurred as follows: 1st, Alabama, Illinois, Indiana, Louisiana, Michigan, Mississippi, Ohio, Pennsylvania, Tennessee, Texas, Wisconsin; 2d, Dakota, North Carolina, Florida, Georgia; 3d, Mississippi, Florida, Alabama; 4th, Illinois, Indiana; 5th, Kansas, Mississippi, Pennsylvania, Texas, Indian Territory; 6th, Alabama, Georgia, Illinois, Kansas, Minnesota, Mississippi, North Carolina, Ohio, Tennessee, Texas, Indiana, Louisiana; 7th, Alabama, Dakota, Colorado, Florida, Georgia, Kansas, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, Minnesota, Indian Territory;

8th, Florida, Georgia, Mississippi, North Carolina, South Carolina; 9th, Georgia, North Carolina, Texas; 11th, Texas; 12th, Florida, Georgia, Louisiana, Mississippi, Texas; 13th, Georgia, Ohio, South Carolina; 14th, Dakota, Kansas, Minnesota; 15th, Iowa, Kansas, Wisconsin, Illinois; 16th, Dakota, Colorado, Illinois, Indiana, Iowa, Kansas, Minnesota, Nebraska, Ohio, Pennsylvania, Indian Territory, West Virginia; 17th, Dakota, Connecticut, Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, New Jersey, New York, Ohio, Tennessee, Texas, Virginia, Wisconsin, Indian Territory, West Virginia, District of Columbia; 18th, Alabama, Illinois, Indiana, Iowa, Kansas, Louisiana, Nebraska, North Carolina, Ohio, Pennsylvania, Tennessee, Texas, New Jersey, Indian Territory, Kentucky; 19th, Delaware, Illinois, Indiana, Maryland, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, South Carolina, Florida, Kentucky, West Virginia, Georgia, District of Columbia; 20th, Canada, Connecticut, Florida, Massachusetts, New Jersey, New York, Virginia, Ohio, Georgia; 21st, Dakota, Minnesota; 22d, Dakota, Kansas, Minnesota, Nebraska, Ohio, Indian Territory; 23d, Illinois, Iowa, Kansas, Louisiana, Michigan, Minnesota, Missouri, Mississippi, Nebraska, Ohio, South Carolina, Texas, Wisconsin, Indian Territory; 24th, Indiana, Kansas, Maryland, Ohio, Pennsylvania, Texas, New York, Kentucky, New Mexico, District of Columbia, Canada; 25th, Texas; 26th, Alabama, Indiana, Kansas, Tennessee, Texas, Indian Territory; 27th, Alabama, Illinois, Indiana, Louisiana, Mississippi, North Carolina, Ohio, Texas, Iowa, Missouri; 28th, Alabama, Florida, Georgia, Indiana, Kentucky, Louisiana, Maryland, Michigan, New Jersey, New York, North Carolina, Ohio, Pennsylvania, West Virginia, Canada; 29th, Connecticut, Delaware, Georgia, Maryland, Massachusetts, New Jersey, New York, North Carolina, Pennsylvania, South Carolina, Virginia, Florida, District of Columbia; 30th, Connecticut, Delaware, Florida, Maine, New York, New Jersey, North Carolina, Massachusetts.

Auroras are reported as follows: 5th, Duluth and Pembina; 7th, observed at 24 stations as follows: in Michigan, 4; Massachusetts, 3; Dakota, 2; New York, 9; Connecticut, 1; Maine, 2; New Hampshire, 1; New Jersey, 1; Vermont, 1; Canada, 1. 8th, Buffalo and Rochester, N. Y.; Port Huron, Mich. 9th, Gardiner, Me.; Cannonsburg, Pa.; Mount Forest, Canada. 12th, Boston, Mass. 13th, Lunenburg, Vt.; Wautoma, Wis. 14th, observed at 76 stations as follows: Michigan, 7; New Jersey, 6; Maine, 9; Massachusetts, 8; New York, 15; Vermont, 5; Pennsylvania, 3; Dakota, 1; New Hampshire, 4; West Virginia, 1; Wisconsin, 3; Connecticut, 3; District of Columbia, 1; Illinois, 2; Indiana, 1; Iowa, 3; Ohio, 1; Virginia, 2; Canada, 1. 15th, Palermo and New York City. 16th, Fort Preble, Maine; Mystic, Conn. 28th, Vevay, Ind.; Monticello, Iowa.

Telegraphic ground currents are reported by the observers as follows: Santa Fé, on the 2d, 10th, 24th, 25th, and 26th; Pike's Peak, on the 6th.

OPTICAL PHENOMENA.

Solar halos.—1st, Ohio, Dakota, Georgia; 2d, Dakota, Mississippi, Tennessee, Wisconsin; 3d, Illinois, New York, Ohio, Michigan, South Carolina; 4th, Maine, New Hampshire, New York, Texas, Michigan; 5th, New York, Dakota; 6th, Iowa, New York; 7th, Florida, Illinois, Maryland, Michigan, Nebraska, Ohio, Indiana, South Carolina; 8th, Delaware, Maryland, Michigan, New Jersey; 9th, Iowa, Massachusetts, Michigan, New York, Connecticut, Minnesota; 10th, Iowa, Louisiana, Mississippi, Ohio, Texas, Michigan, Minnesota, Montana; 11th, Illinois, Iowa, Michigan, New York, Wisconsin, Indiana, Minnesota; 12th, Iowa, Michigan, Wisconsin, South Carolina, Minnesota, Kansas, North Carolina; 13th, Illinois, Indiana, New Jersey, New York, Ohio, Pennsylvania, Wyoming, Colorado, Texas, Connecticut; 14th, Iowa, Maine, Maryland, Missouri, Nebraska, New Hampshire, New York, Connecticut, Rhode Island; 15th, Iowa, New Hampshire, Michigan, Wyoming; 16th, Indiana, Maine, New Hampshire, New York, Ohio, Rhode Island, Louisiana; 17th, Georgia, Maine, Michigan, Ohio, Wisconsin, New Jersey, South Carolina, Kentucky, Alabama; 18th, Illinois, New York, Georgia; 21st, Arkansas, Indian Territory; 22d, New Jersey, Tennessee; 23d, Connecticut, Delaware, Illinois, Massachusetts, New Jersey, New York, Tennessee, Rhode Island; 24th, Illinois, Kentucky, New York, Alabama; 25th, Illinois, Iowa, Massachusetts, Ohio, Vermont; 26th, Illinois, Indiana, New Jersey, New York, Ohio, Pennsylvania, South Carolina; 27th, Connecticut, Maine, Massachusetts, Michigan, New Hampshire, New York, Ohio, Vermont, South Carolina, Rhode Island; 28th, Maine, New Hampshire; 29th, Iowa, Tennessee; 30th, Tennessee, Texas.

Lunar halos.—1st, Ohio, North Carolina; 3d, Indiana; 16th, Massachusetts; 17th, Dakota, New Mexico; 18th, Dakota, South Carolina, Minnesota, New Mexico; 19th, New Jersey, Ohio, Michigan, Dakota, Minnesota, North Carolina; 20th, Delaware, Kansas, Massachusetts, Missouri, New Jersey, Texas, Minnesota, North Carolina; 21st, Florida, New Jersey, New York, Indian Territory, Kansas, Georgia, North Carolina, Louisiana; 22d, Florida, Iowa, Kansas, Missouri, New Jersey, New York, Michigan, Louisiana, Connecticut, North Carolina; 23d, Connecticut, Illinois, Iowa, Michigan, Massachusetts, Minnesota, Ohio, Indiana, Tennessee, Alabama, Florida; 24th, Iowa,

Kansas, Kentucky, Nebraska, New Hampshire, New Jersey, New York, North Carolina, Ohio, Dakota, Minnesota, Colorado, Maine, Indiana, Florida, Rhode Island, Georgia, Connecticut; 25th, Illinois, Indiana, Ohio, Wisconsin, Iowa, South Carolina, Virginia, North Carolina, West Virginia, Louisiana, Minnesota; 26th, Connecticut, Indiana, Massachusetts, New York, Georgia, Minnesota, Illinois, Maine, Rhode Island, Ohio; 27th, Kentucky, Maine, New Hampshire, Ohio, Tennessee, Minnesota, Georgia; 28th, Indiana; 29th, Tennessee; 30th, Tennessee.

Mirage.—2d, Fort Pembina, Dak.; 7th, 21st, Duluth, Minn.; 19th, Marquette, Mich.; 24th, Atlantic City, N. J.

Scintillation of stars.—No observations of scintillation have been received for April

MISCELLANEOUS PHENOMENA.

Zoological.—BOTANICAL.—The blooming of flowers and trees has been reported as follows: *Anemones*, 17th, Massachusetts. *Dandelions*, 19th, Massachusetts. *Apricots* in bloom, 1st, Maryland; 15th, Kansas; 16th, New Jersey; 26th, Pennsylvania. *Apple-trees* in bloom, 15th, Indiana (first bloom); 20th, Ohio; 22d, West Virginia; 26th, Ohio; 28th, Illinois; 30th, Missouri (full bloom), Indiana. *Blackberries*, 16th, Louisiana (ripe). *Crab-apples* in bloom, 29th, Kansas. *Currants*, 20th, Ohio. *Cherry* in bloom, 4th, Virginia; 8th, Maryland; 15th, Kansas; 20th, Illinois; 22d, Maryland, New Jersey; 23d, Kansas; 24th, West Virginia; 25th, New Jersey; 26th, New York; 27th, New Jersey; 28th, New York; 29th, Ohio; 30th, Missouri, Ohio, Indiana. *Fever bush* in bloom, 25th, Massachusetts. *Magnolias* in bloom, 23d, Massachusetts (full bloom). *Maples* in bloom, 20th, Massachusetts (red maple). *Peach* in bloom, 4th, Illinois; 6th, Kansas; 8th, Maryland; 14th, Kentucky; 15th, Kansas; 17th, Maryland, New Jersey; 21st, Nebraska (full bloom); 22d, Illinois; 23d, Nebraska; 24th, New Jersey, Ohio; 26th, New York, Pennsylvania; 30th, Indiana. *Pear-trees* in bloom, 4th, Virginia; 12th, New Jersey; 16th, New Jersey; 19th, Indiana (full bloom), Ohio; 23d, New Jersey; 26th, Ohio, Pennsylvania; 30th, Missouri, New Jersey, Ohio, Indiana. *Plum* in bloom, 12th, Kansas; 13th, Kansas; 15th, Kansas; 17th, Maryland; 19th, Illinois; 20th, Illinois, Ohio; 21st, Nebraska; 22d, Nebraska; 24th, West Virginia; 26th, Ohio. *Strawberries* in bloom, 4th, Illinois; 16th, New Jersey; 26th, Ohio. *Willow-trees* in bloom, 19th, Massachusetts. *Violets* in bloom, 17th, Massachusetts (Dog-tooth); 26th, Massachusetts (blue).

BIRDS.—The first arrival and their migrations are reported as follows: *Bluebirds*, 1st, Wisconsin; 3d, Wisconsin; 4th, Ohio; 12th, Minnesota; 24th, Utah. *Blackbirds*, 1st, Somerset, Mass. (first seen), New Hampshire, Wisconsin; 2d, Vermont; 3d, Maine, flying north, Wisconsin; 4th, Iowa, New York; 10th, Iowa; 12th, Minnesota, New Hampshire, New York; 14th, Vermont; 22d, Dakota; 26th, Utah. *Cat-birds*, 23d, Virginia. *Cranes*, 1st, Wisconsin, north; 4th, Iowa, north; 10th, Iowa, north. *Ducks*, 1st, New York; 4th, Iowa, north; 10th, Dakota, north. *Wild geese*, 1st, Iowa, south, New York, Wisconsin; 2d, Kansas, northeast, Massachusetts, southeast, Connecticut, north; 3d, Maine, north, Mount Desert, Me. (first seen), New Hampshire, north, Massachusetts, north; 4th, Iowa, north, Maine, north, Maryland, northwest; 8th, Iowa, north, Connecticut, north; 9th, Minnesota, north; 10th, Maine, northeast, Dakota, north; 11th, Dakota, south and north, Maine, northeast; 13th, Dakota, north, Massachusetts, southeast; 14th, Dakota, north, Massachusetts, north and east; 15th, Connecticut, east; 16th, Dakota, north; 17th, Connecticut, north, Massachusetts, north, New Jersey, northwest; 19th, Dakota, north; 20th, New Jersey, north; 21st, Maryland, north; 24th, Massachusetts, north. *Hawks*, 8th, Dakota, north. *Killdeer*, 19th, New York. *Larks*, 1st, New York; 2d, Massachusetts, New York; 3d, Wisconsin; 4th, New York; 6th, Ohio; 12th, New Hampshire; 14th, New York; 24th, Utah. *Martins*, 1st, Maryland (first seen), Pennsylvania, Tennessee; 2d, Kansas; 4th, West Virginia; 7th, Missouri; 10th, Maryland; 13th, Ohio; 14th, Massachusetts; 16th, Wisconsin; 17th, New Jersey; 23d, North Carolina, Wisconsin; 24th, Indiana, New York; 28th, New Hampshire. *Mocking-birds*, 4th, Florida (singing); 7th, Kansas; 10th, Illinois; 15th, Virginia. *Oriole*, 13th, Vermont. *Prairie-chickens*, 4th, Iowa. *Pigeons*, 19th, Ohio; 25th, Iowa. *Pewee* or *phebe birds*, 2d, New York; 3d, Nebraska, Wisconsin; 4th, New York; 9th, New Hampshire; 12th, Ohio; 14th, Vermont. *Robins*, 1st, Massachusetts, Wisconsin, Maine; 2d, New Hampshire, New York; 3d, Vermont, Wisconsin; 4th, Vermont; 5th, Ohio; 7th, Minnesota; 8th, Michigan; 9th, New York, Dakota; 11th, Wisconsin; 17th, Maine; 19th, Creswell, Kans. (first one seen in six years); 24th, Utah. *Snipe*, 1st, New York; 10th, Illinois. *Sparrows*, 4th, Vermont; 7th, Maine, Ohio, Vermont; 8th, Vermont; 9th, New Hampshire; 12th, Wisconsin; 14th, New York. *Swallows*, 6th, Mississippi; 10th, Kansas, Massachusetts; 11th, Massachusetts; 12th, New York; 15th, Ohio; 17th, Illinois, New Jersey; 18th, New York, Wisconsin; 20th, Wisconsin; 21st, New Mexico (first seen), Massachusetts, Nebraska, Wisconsin; 22d, Pennsylvania; 23d, Pennsylvania, Wisconsin; 24th, Iowa, Massachusetts, North Carolina, Vermont; 25th, New Hampshire; 26th, New York, Pennsylvania; 27th, Maine, Ohio; 28th, Connecticut. *Thrush*, 6th, Massachusetts; 17th, Ohio. *Whip-poor-will*, 1st, Florida; 15th, Virginia; 20th, Illinois, Nebraska; 21st, Iowa; 22d, Indiana, North Carolina; 23d, Maryland. *Woodpeckers*, 8th, West Virginia.

FISHES.—*Shad*, 11th, Ardenia, N. Y. (first caught); 13th, Flushing, N. Y. (first caught), and numerous on the 18th.

INSECTS.—*Grasshoppers*, 7th, at Macon, Ga., blown thither by storm-winds; 10th, Howard, Nebr., first eggs hatched; Dennison, Iowa, hatching during month; at Tabor, Iowa, but few hatched out; 13th, Fort Gibson, Indian Territory, numerous; Corning, Mo., those hatched in February have disappeared; 23d, Denison, Tex., first appeared; 30th, Creswell, Kans., nearly all gone; Corsicana, Tex., very numerous; corn and wheat damaged. *Colorado beetle* or *potatoe-bug*, 9th, Wappinger's Falls, N. Y.

Polar bands.—New Hampshire: Auburn, 1st, 4th, 16th. Mississippi: Brookhaven, 2d. Iowa: Tabor, 5th, 18th; Iowa City, 10th, 14th, 16th, 24th; Muscatine, 24th. South Carolina: Charleston, 6th. Ohio: Carthagena, 6th, 7th, 9th, 10th, 12th, 23d. Georgia: Tybee Island, 7th. Virginia: Wytheville, 7th, 9th, 15th. New Jersey: Vineland, 8th; Freehold, 22d. Louisiana: Point Pleasant, 10th. Minnesota: Duluth, 14th, 29th. New York: Waterburg and Flushing, 14th; Malone, 24th. Maine: Gardiner, 24th, 28th.

Prairie and forest fires.—Fort Randall, Dak., 1st, 3d, 12th; Bismarck, Dak., 14th, 15th, 20th, 21st, 23d; Monticello, Iowa, 8th; Creswell, Kans., 3d, 4th, 5th, 6th, 7th, 10th, 13th, 19th, 20th, 29th; near Fall River, Mass, 22d, raging for three days; Saint Paul, Minn., 8th; Genoa, Nebr., 15th; Eastport, Me., 27th; Wytheville, Va., 6th, 24th; Morgantown, W. Va., 13th, 14th; Embarrass, Wis., 13th, 22d; near Scranton, Pa., 15th; Barnegat, N. J., 24th, 25th; Denison, Tex., 10th.

Meteors.—Iowa: Davenport, 1st; Monticello, 20th. Dakota: Yankton, 4th. New York: Wappinger's Falls, 9th, 10th; Flushing, 10th; Vermillion, 11th; Waterburg, 13th; Coopers own, 15th. New Hampshire: Contoocookville, 12th; Auburn, 14th, 21st. Indiana: Vevay, 12th, 13th, 14th. Wisconsin: Wautoma, 13th. New Jersey: Vineland, 14th. Indiana: Bloomington, 15th. District of Columbia: Washington, 22d. Ohio: Jacksonburg, 25th. Virginia: Wytheville, 27th. Vermont: Woodstock, 30th.

Sunsets.—The characteristics of the sky, as indicative of approaching fair or foul weather, have been observed daily at sunset at all Signal-Service stations. The monthly summaries from eighty-eight stations show that 98 doubtful cases and blanks were recorded, and that, out of the remaining 2,542 cases, 2,108, or 82.8 per cent., have been followed by the expected weather.

Zodiacal light.—Connecticut: Colebrook, 7th, 9th, 12th. Georgia: Savannah, 5th, 6th, 14th. Iowa: Monticello, 1st, 2d, 4th, 5th, 6th, 7th, 15th, 29th, 30th. Ohio: Bellefontaine, 5th, 9th, 12th. Maine: Cornish, 11th. Massachusetts: Somerset, 6th; Fall River, 3; Cambridge, 3d, 6th, 9th, 12th. New Jersey: Atco, 5th, 6th, 7th, 10th, 12th, 14th, 15th. New York: Waterburg, 2d, 6th, 7th, 9th, 10th, 11th, 12th, 13th, 14th; North Argyle, 9th. Virginia: Wytheville, 5th, 6th, 14th, 29th.

Earthquakes.—Panama, 17th, slight shock of short duration, 5.50 a. m.; Auburn, N. H., 23d, slight shock from northwest to southeast at 11 a. m. A slight shock was felt at Franklin, N. C., at 5 p. m. of 26th.

NOTES AND EXTRACTS.

In the Paris Comptes Rendus des Academie des Sciences de Paris for March 12, 1877, and in the Bulletin International de l'Observatoire de Paris for March 20, M. de Crova gives some measures showing the variations of the solar heat as received at the earth's surface. Observations were taken on January 4 and July 11, 1876, continuously throughout these remarkably clear and quiet days. The following are the results of his calculations:

Total amount of heat received at Paris upon one square centimeter.	January 4, 1876.		July 11, 1876.	
	Normally to sun's rays.	Upon a horizontal surface.	Normally to sun's rays.	Upon a horizontal surface.
	Calories.	*Calories.*	*Calories.*	*Calories.*
1. Total from sunrise to noon	264.4	78.9	451.5	293.5
2. Total from noon to sunset	270.6	82.3	494.9	293.6
3. Total from sunset to sunrise.	935.0	161.2	876.4	571.1
During the hours of sunshine the heat received in one minute varied from	0 to 1.29	0 to 0.53	0 to 1.21	0 to 1.10
The ratios of the total amounts of heat received daily upon normal and horizontal surfaces	$\frac{1}{3.31} = 0.301$		$\frac{1}{1.53} = 0.655$	

The ratios of the heat received on these two days are { Normally $\frac{1}{1.63} = 0.61$; Horizontally $\frac{1}{3.51} = 0.28$ }

In Poggendorff's Annalen, 1877, No. 1, page 31, Haga gives a further contribution to our knowledge of the absorption of the radiant heat by aqueous vapor. He shows that of the heat that emanates from a plate covered with lampblack and heated to 212° Fah., probably 0.86 of 1 per cent. is absorbed in passing through a column of aqueous vapor 0.951 foot long at a temperature of 62°.6 or 64°.4 Fah.; also 0.61 of 1 per cent. is absorbed in passing through a column of vapor 0.623 foot long at the same temperature; whence it follows that for a column of vapor 3,281 foot long at 62°.6 or 64°.4 Fah., the absorption would be 3.1 per cent., and for a column 10,827 feet long the absorption is 10 per cent. In these experiments the heat-rays had first passed through a small extent of the atmosphere of the room. Assuming that rays of all wave lengths are absorbed with equal facility, we can now compute the absorption by a column, at any other temperature, and of any other length, and, consequently, that due to the moisture contained in the atmosphere at any time.

In a memoir by Leonardo de Tejeda, on the hurricane of the 13th of September, 1876, the central track, as it passed over the West Indies, is charted as passing over the northern edge of St. Kitt's, then about 5 miles north of Santa Cruz, then directly through the center of Porto Rico from Yabucoa on its southeast coast to Rincon at its northwest extremity, thence through the central portion of Hayti and the eastern half of Cuba. The greatest severity of the winds occurred at St. Kitt's on the 12th, 8.30 p. m.; at San Juan, 13th, 8.30 a. m.; at Yabucoa, 13th, 7 a. m.; at Rincon, 13th, 11.30 a. m.; at Porto Platte, Hayti, 13th, 8.30 p. m. In moving over the interior of the island of Hayti its average hourly velocity was approximately 21.7 miles. The greatest hourly velocity of winds observed at San Juan, de Porto Rico, was from 62 to 80 miles. This storm is the same as that numbered VII in the Signal-Service Weather Review for September, according to which its central track lay a little to the east of Florida; it passed centrally over Wilmington on the 17th, at 8 a. m., and over Washington, at 5 p. m.

In the Bulletino Meteorologico del Osservatoire del Collegio Romano, for March, is given the mean daily velocity of the wind as observed at Rome from 1862 to 1876. The annual periodicity is well shown by the following monthly means:

Month.	Mean.	Month.	Mean.
	Miles daily.		*Miles daily.*
January	124.5	August	124.0
February	106.2	September	110.0
March	140.4	October	115.5
April	117.2	November	123.1
May	120.9	December	127.2
June	122.4	Annual	122.6
July	130.3		

From the Appendix to the Bulletin des Observatoire de Zi-Ka Wei, China, we compile the following table, based on four years of observations, 1873–'76, inclusive:

Zi-Ka-Wei, latitude 31° 12′, longitude 7h 56m east of Paris; altitude 23 feet.	Pressure.	Temperature in shade. Fahrenheit.			Force of vapor.	Relative humidity.	Cloudiness.	Number of rainy days.	Rain-fall.	Prevailing winds.
	Inches.	*Mean.*	*Max.*	*Min.*	*Inches.*	*Pr. ct.*			*Inches.*	
January	30.351	35°.4	60.1	16.5	0.173	83	6.2	8.2	2.287	N.W.
February	30.259	40°.3	77.9	18.9	0.197	78	6.5	9.7	2.36	N.E.
March	30.151	47°.1	78.6	29.8	0.264	78	6.6	14.0	3.19	N.E.
April	29.993	57°.7	88.7	32.7	0.366	75	5.5	9.2	2.16	S.E.
May	29.861	67°.3	96.3	37.4	0.508	77	6.4	9.5	1.93	S.E.
June	29.749	74°.9	95.7	35.4	0.697	83	7.4	14.8	10.12	S.E.
July	29.686	81°.7	102.0	66.0	0.878	81	5.4	8.0	1.69	S.E.
August	29.741	80°.4	98.2	62.2	0.854	82	5.5	9.5	4.76	S.E.
September	29.895	73°.4	95.5	44.2	0.673	81	5.9	9.2	5.65	N.E.
October	30.107	63°.3	84.2	39.0	0.457	78	5.7	8.2	3.76	N.E.
November	30.239	50°.7	78.1	26.4	0.295	74	3.9	4.5	0.70	N.W.
December	30.286	43°.0	70.0	17.2	0.240	78	4.3	4.5	1.12	N.W.
Year	30.026	59°.4	102.0	16.5	0.461	79	5.7	109.5	39.25	.....

For the same important station the following wind-roses are given for the years 1875–'76:

Wind-direction.	Mean pressure.	Mean temperature.	Force of vapor.	Relative humidity.
	Inches.	*Fahrenheit.*	*Inches.*	*Per cent.*
N	30.036	56°.9	0.429	80.4
N. E	30.028	59°.2	0.455	79.5
E	30.019	59°.8	0.483	80.7
S. E	30.004	60°.8	0.485	79.5
S	29.963	63°.7	0.492	73.4
S. W	29.940	63°.0	0.478	70.9
W	29.940	59°.4	0.457	74.6
N. W	29.997	57°.7	0.412	78.1
N	30.036	56°.9	0.429	80.4
Average 1875 and 1876	29.991	60°.0	0.461	77.0

In the Resumé for 1876 of the Commission de Meteorologie de la Haute Savoie, occurs the following passage relative to the thunder-storms of this department of France: "Our thunder-storms ordinarily come from the southwest, but as often we see them follow the courses of the valleys without regard to the compass bearings; they are preceded by mists, rarely by cirri, then by clouds which generally grow denser and lower. At the same time the atmosphere is charged with electricity, and the fall of the barometer is irregular and saltatory. * * * The occurrence of thunder-storms is subject to too many unknown circumstances to justify the risk of predicting them. There are some zones of thunder-storms which cover several departments, so that when the lightning starts at any point, the thunder-storms burst simultaneously over the whole area, and it is then already too late to send a telegraphic warning; at other times, on the contrary, the storm is dissipated before it matures."

In the Monatliche Ubersicht der Witterung, January, 1877, der Deutsche Seewarte, the following items are given as the pricipal characteristics of the weather of Central Europe during January:

1. The large variations of barometric pressure, especially in the second half of the month (28.66 to 30.71 inches); the monthly mean pressure was, however, near the normal value.

2. The large number of barometric minima which pursued their way through Central Europe; the most notable were those of the first and last days of the month.

3. The stormy weather attending these areas of low pressure, especially the great storms of the 1st and 2d, and the 30th and 31st; on every day of the month, at one or more stations, a wind-force was observed of 8, 9, or 10 of the Beaufort Scale, and during the 1st to 7th, and the 25th to 31st, storm-winds prevailed over large areas.

4. The flood-wave in East Friesland, accompanying the storm of 30th and 31st (the highest of the century, except that of 1825); and the overflow in West Prussia, due to the extensive and long-continued stoppage by ice.

5. The extraordinary high temperature, especially in the first half of the month, the excess of the monthly means above the normal values, ranges from + 35.2 F., for the Baltic Provinces to + 40.6 F. for Würtemburg, + 40.6 F. for Central Austria, + 37.9 F. for Switzerland.

6. The large precipitation, which amounted to twice its usual amount in the Netherlands and some portions of Hanover and Lausitz.

The verifications of the predictions, published by the Hamburg Seewarte for January, which was an unusually unfavorable month, are announced as follows:

Month.	Weather.	Wind.	Temperature.	Average.
	Per cent.	*Per cent.*	*Per cent.*	
Well verified	68	67	70	68
Partly verified	22	21	25	22
Not verified	10	12	5	10

In the Zeitschrift der Osterreichischen Gesellschaft für Meteorologie for 15th March, Von Obermayer gives a clear presentation of the arguments for and against the existence of hollow vesicles of vapor in clouds, fogs, &c., and shows that we have reason to believe that such vesicles cannot possibly exist, and that all known phenomena are well explained as due to extremely small solid drops.

Published by order of the Secretary of War.

ALBERT J. MYER,
Brig. Gen. (Brevet Assigned), Chief Signal-Officer, U. S. A.

PAPER 36.

MONTHLY WEATHER REVIEW, MAY, 1877.

INTRODUCTION.

The present review for the month of May depends upon all data received up to the 15th of June from the Canadian Meteorological Service, the United States Signal-Service and volunteer observers, the Army post surgeons, and the United States Navy. The most interesting features of the month have been: First, the remarkable high temperature from the 18th to the 24th; second, the heavy rain-fall west of the Mississippi and the drought in California, also the light rains in the Lake region, and the forest-fires in Michigan and New York; third, injury done to grasshoppers in the West and Southwest by cold and rainy weather; fourth, the earthquake of Iquique, and the ocean-wave resulting therefrom; also similar wave on the 15th on Lake Erie; fifth, the aurora of the 28th; and, sixth, tornadoes and hail-storms in New York and New England on the 18th.

BAROMETRIC PRESSURE.

In general.—The general distribution of atmospheric pressure is shown by the isobars upon Chart No. II; these present no marked resemblance to those of May in any of the preceding five years, but agree better with the average or normal values. The barometric pressure has been decidedly low at the Rocky Mountain stations and in Oregon. By comparison with a chart of average mean pressures for May for the years 1872 to 1876, inclusive, it will be seen that during the present month the isobar of 30.00 has extended northward over the Lake region, or 12° of latitude north of its average position in Tennessee and Virginia. The area of pressures lower than 29.85 has, during the past month, been well developed on the eastern slope of the Rocky Mountains, and the same isobar crosses New Brunswick and Nova Scotia at an unusual distance inland. Barometric pressures have, therefore, been below the average in Northern New England and the Canadian Provinces, but above the average in the Lake region.

Barometric range.—The general range of the barometer over the whole country east of the Rocky Mountains was about 1.25 inches, as may be seen from the following table, which gives the maximum and minimum pressures that occur on the tri-daily maps (7.35 a. m., 4.35 p. m., and 11 p. m., Washington time), near the centers of the respective areas of high and low barometer:

LOW AREAS.

No.	Location.	Date.	Minimum barometer.
I	Gulf of St. Lawrence	May 3, 4.35 p. m	29.24
II	Tennessee	May 3, 4.35 p. m	29.70
III	Texas	May 3, 4.35 p. m	29.65
IV	Dakota	May 5, 7.35 a. m	29.44
V	Ohio Valley	May 5, 7.35 a. m	29.65
VI	Ohio Valley	May 7, 4.35 p. m	29.57
	Halifax	May 10, 7.35 a. m	29.63
VII	South Atlantic coast	May 7, 11 p. m	29.58
VIII	Manitoba	May 15, 4.35 p. m	29.55
IX	Minnesota	May 17, 4.35 p. m	29.37
X	Key West, Fla.	May 17, 4.35 p. m	29.84
XI	Minnesota	May 25, 11 p. m	29.27
XII	Minnesota	May 31, 4.35 p m	29.15

HIGH AREAS.

No.	Location.	Date.	Maximum barometer.
I	Texas	May 1, 7.35 a. m	30.19
II	Manitoba	May 7, 7.35 a. m	30.25
	Lower Lakes	May 12, 7.35 a. m	30.40
	South Atlantic States	May 15, 7.35 a. m	30.40
III	Manitoba	May 24, 7.35 a. m	30.37
	Middle Atlantic States	May 28, 7.35 a. m	30.35

The greatest local barometric ranges have been as follows: Bismarck, 1.29 inches; Breckenridge, 1.14; North Platte, 1.12; Yankton, 1.05; Duluth, Eastport, and Mount Washington, 1.01. The smallest local barometric ranges have been: Key West, 0.25; Santa Fé, .38; Galveston, .48; Indianola, .49; Cairo, Vicksburg, and Salt Lake City, .50.

Areas of high pressure.—No. I. On the first day of May the pressure was highest over the Gulf States, and on the 2d extended thence northward to the Lake region, after which it subsided, drawing eastward to the Atlantic, and was followed by a very general depression. Heavy damaging frosts were reported on the morning of the 2d in Central and Southern Illinois.

No. II. On the 6th, in the morning, rising barometer, with cooler northerly winds, pressed southward over Canada and the Lake region, and by the 7th, in the morning, the barometer had risen 0 35 in Manitoba, and was high from Dakota to the Saint Lawrence Valley. From this time on the pressure began to dimish slowly. On the 9th, in the morning, the area of highest barometer extended from the Upper Lakes southward to the Gulf of Mexico, and so continued until the morning of the 11th, at which time an area of 30.25 prevailed over Canada, the Lake region, Middle and South Atlantic States. The barometer rose slowly over this entire region, as also over New England during the next twenty-four hours, and on the 12th, 7.35 a. m., an area of 30.40, covered Upper Canada. This marked southeastward extension of the area of high pressure probably was also connected with a storm-center still farther southeast, since the marine reports show on the 12th a heavy northeast gale, lasting forty-eight hours, in latitude 24° 38′ north, 66° 30′ west. The pressure now diminished slightly, and on the 14th continued highest from Upper Canada to the South Atlantic coast, but had fallen decidedly in New England and west of the Mississippi. During the next twenty-four hours the barometer rose in the South Atlantic States, but fell elsewhere, and on the 15th, 7.35 a. m., the area of 30.40 covered the Carolinas, where it remained central, with slowly diminishing pressure, until, on May 21, 7.35 a. m., it had disappeared, with the barometer at 29.90 to 95, which pressure was about the highest exhibited on that map, and appears to have prevailed over the entire Gulf of Mexico and Gulf States.

No. III. The barometer rose rapidly in Dakota on the 21st, following in the rear of storm No. XI, and on the 22d, 7.35 a. m., the highest pressure, 30.22, was reported in Manitoba. This area extended southward over the Mississippi Valley, and on the 23d, 7.35 a. m., the pressure of 30.35 prevailed north of Lake Superior and Minnesota, with a northerly gale in the upper lakes. The area of rising barometer continued extending south and east during the 23d, 24th, and 25th, and on the morning of the 25th the highest pressure, 30.26, was central over the Upper Lake region, whence it moved slowly southeastward, and on the 27th, 7.35 a. m., the area of 30.22 was central in the Ohio Valley. This area now advanced eastward, and the central pressure now rose decidedly, so that on the 28th, 7.35 a. m., the area of 30.35 was central in Maryland, and on the 29th, in the morning, the pressure of 30.30 prevailed off the New Jersey coast. The central highest pressure continued over the Middle Atlantic States during the 20th and 30th, but the barometer fell steadily here, as it did, in fact, throughout the whole country, while the formation of low pressure, No. XII, was in progress. The area of 30.10 was central on the morning of the 31st over the Carolinas, but the pressure rose during the rest of the 31st in the Gulf States, as soon as low barometer No. XII began to move northeastward, and on June 1st, 7.35 a. m., the highest pressure, 30.22, was over North Carolina.

Areas of low pressure.—But few well-defined areas of low pressure are charted upon map No. I, since, out of the twelve that are mentioned in the text, only the tracks of five could be satisfactorily given. Most of those that are charted lie somewhat southward of the average positions in former years. Their history in detail is as follows:

No. I. First appears some distance off the New England coast, on the morning of the 1st, and during the 2d rapidly assumed the proportions of a severe cyclone, which seems to have passed northward over Labrador. The report of heavy north-northwestern gales for three days preceding May 1, at the Bermudas, suggests that this cyclone must have moved slowly northward, passing a little to the east of those islands.

No. II. This depression originated on the 2d in Kansas and Texas, whence it passed eastward, and was dissipated on the 3d in the Ohio Valley.

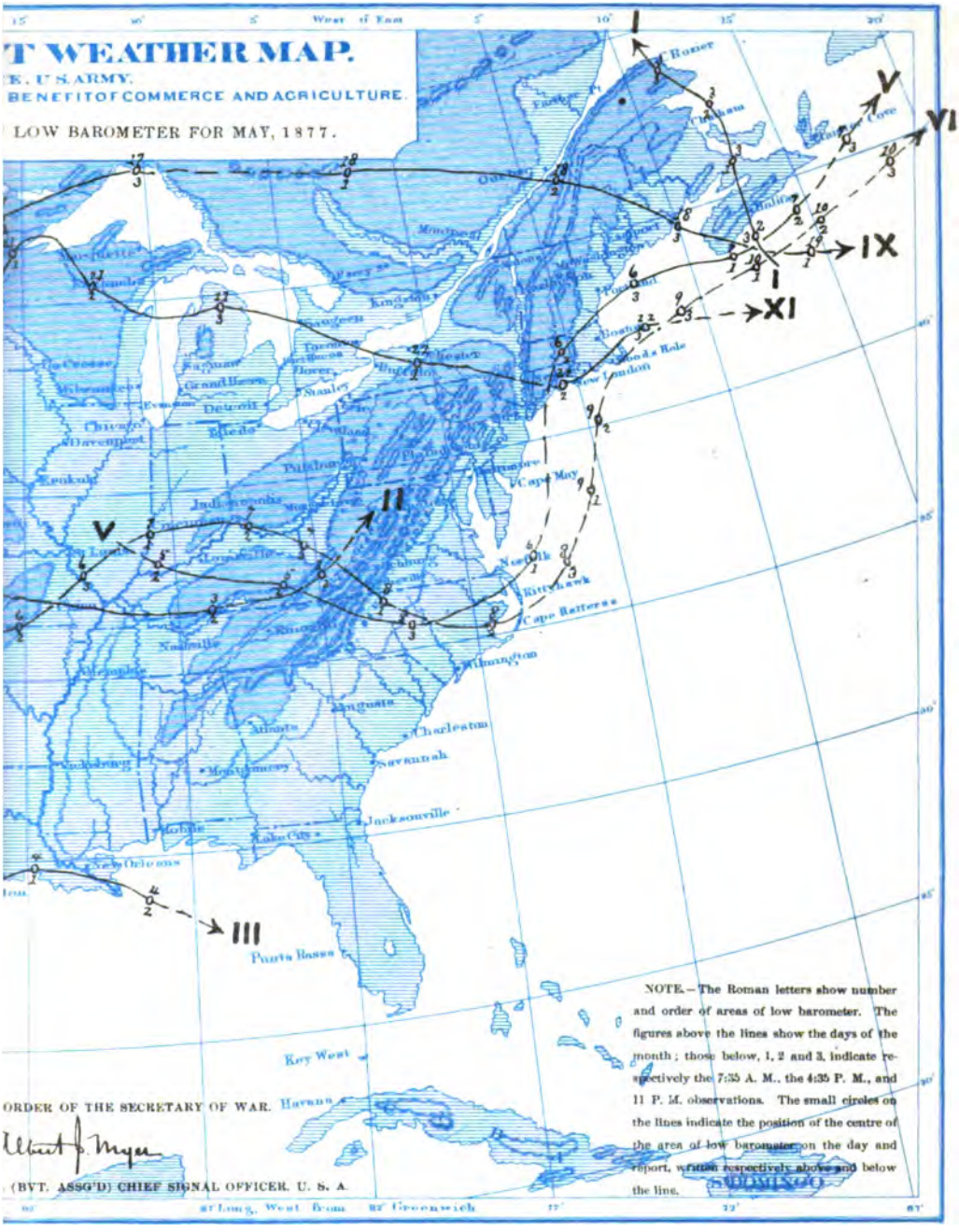
No. III. This depression had the same origin as No. II; but in its eastward course kept near the Gulf coast, and was dissipated on the 4th in the East Gulf States.

No. IV. This depression appears on the 4th and 5th, extending from Manitoba southeastward over the northwest, very generally accompanied by light rains. As it extended southward the rain-area extended over the entire Gulf States and the Ohio Valley, giving rise to several centers of slight depression.

No. V. The very general rains that prevailed in the Gulf and Atlantic States on the 4th and 5th gave rise, as aforesaid, to several slight depressions, one of which, No. V, moved eastward over the Alleghanies on the 5th. This storm has been charted as


WAR DEPARTME
SIGNAL SE
DIVISION OF TELEGRAMS AND REPORTS FOR
TRACKS OF CENTRES OF ARE
XI
IX
II
VI
III
San Francisco
San Diego
Ft Yuma
Denver
Santa Fe
Chicago
Indianola
PUBLISHED
BRIG. G
AVERAGE PROGRESS OF AREAS OF LOW BAROMETER
EAST OF THE 100TH MERIDIAN.
No. | Velocity.
I 15 miles per hour.
II 40 do.
III. 27 do.
IV.* — do.
V. 23 do.
VI. 20 do.
VII.* — do.
VIII.* — do.
IX. 34 do.
X.* — do.
XI. 27 do.
XII.* — do.
* Too ill-defined to be charted.

No. I.



ORDER OF THE SECRETARY OF WAR.

(BVT. ASSG'D) CHIEF SIGNAL OFFICER, U. S. A.

though it continued its course east of the Atlantic course, and subsequently developed in the severe storm which was off the Nova Scotia coast on the 7th. The marine reports, however, make it likely that No. V, after crossing the Alleghanies on the 6th, united with the tornado that passed over Saint Marks, Fla., at 2 p. m., and subsequently with a severe storm then existing over the Gulf Stream. Thus reports from latitude 35° 53′ north, 68° 19′ west, show that a destructive southwest hurricane prevailed in that locality on the 6th.

No. VI and VII. The general depression which prevailed during the 5th west of the Mississippi extended somewhat eastward during the 6th, and is considered as the origin of low barometer No. VI. This was, on the morning of the 7th, central in Illinois and Indiana, and on the afternoon central in Southern Ohio, at which time, also, a second depression (No. VII) was developing off the South Atlantic coast, and a third off the New England coast, which latter it may possibly be proper to consider as a continuation of storm No. V. The two areas, No. VI and VII, merged into one on the 9th, which was central at 11 p. m. of the 8th off the North Carolina coast. During the 9th its course was apparently northeastward toward Nova Scotia, along the coast of which province it passed on the 10th, and then disappears from our chart. There was at this date a severe storm in the southern part of Great Britain, but as no other storm-center appears on the European weather maps until the 16th, it is probable that storm No. VI did not advance to Europe.

Nos. VIII and IX. West of the Mississippi the barometer continued low during the greater portion of the time from the 9th to the 16th; but this condition, which is the normal one for this region at this time of the year, gave rise principally to local storms (on the 11th at Brownwood, Tex., a destructive rain and hail storm; on the 16th, tornado at Fulton, Mo.), which, increasing day by day in severity, finally culminated in a heavy rain-fall and local storm in Eastern Kansas on the 16th, and the small depression, No. IX, which, starting on the 15th in Northern Dakota, stretched along the northern limit of our maps, and on the 18th appears as a well-defined area of low-pressure central in the Saint Lawrence Valley; it moved thence southeastward over Nova Scotia, and disappeared on the 19th. When central, on the 18th, in the Saint Lawrence Valley, the warm southwest winds that prevailed over New England and New York were attended by severe local storms, as follows: Violent hail and thunder at Stanstead, Vt., and in Northwestern Rhode Island; tornadoes near Quebec, at St. Hippolyte, Canada, and Stuyvesant, N. Y. The most violent of these tornadoes passed to the north of the latter; its track is traced from Saratoga County southeastward through Argyle, in Washington County, N. Y., to Shaftsbury, in Bennington County, Vermont.

No. X. The barometer fell decidedly during the 16th and 17th in Southern Florida, while an area of high pressure extended eastward over the South Atlantic States. The heavy rains and brisk winds seemed to show that a slight disturbance advanced westward over the Gulf of Mexico from that date to the 19th; but no definite track of its course can at present be given.

No. XI. The permanent low pressure on the eastern slope of the Rocky Mountains culminated on the 19th in the formation, in Dakota, of a progressive area of low pressure, which was central on the morning of the 20th in Eastern Dakota, but in the afternoon in Southern Minnesota; it passed slowly northeastward over the Upper Lake region, being central in the afternoon of the 21st in Wisconsin, then stretched eastward over the Middle States and New England, and was on the morning of the 22d central near Long Island. The first part of the course of this area of low pressure was, as usual, southeastward down the Missouri Valley, and floods were produced on the 20th and 21st in the Missouri and Kansas Rivers. Very destructive tornadoes on the 20th passed over Marion, Ind., and Black Earth, Wis.

No. XII. An area of high pressure occupied the Lake region and Mississippi Valley during the rest of the month, but on the 27th the pressure began to diminish west of the Mississippi, and from the 28th to the 31st a well-marked area of low-pressure remained permanently central in Dakota, with steadily diminishing central pressure, and on its south and east sides an increasing area of brisk and high southerly winds and locals rains (amounting sometimes to incipient tornadoes at Sioux City, Iowa, and Saint Paul, Minn., on the 30th, and in Lafayette County, Missouri, on the 31st). On the afternoon of the 31st the central area, whose pressure had fallen to 29.15, began moving eastward into Minnesota, and probably disappeared during the first few days of June in British America.

Vessels experiencing storms at sea.—The following notes relating to storms at sea have been received: On the 1st heavy northwest gales for three days off Bermuda, probably the same as storm No. I; on the 6th a destructive hurricane from the southwest was experienced in latitude 35° 53′ north, longitude 68° 19′ west; on the same date, in the same latitude, heavy northwest gale, possibly the same as storm No. V; on the 12th heavy northwest gale for forty-eight hours in 24° 38′ north, 66° 30′ west; on the 16th strong south and east-southeast gale in 27° 32′ south, 49° east.

TEMPERATURE OF THE AIR.

In general.—The general distribution of temperature is shown by the isotherms on Chart No. II, from which it will be seen that the isotherm of 75° passed from Central Texas eastward through the northern portion of the Gulf of Mexico and over the central portion of the Florida Peninsula. The isotherm of 45° skirts along the coast of the Gulf of Saint Lawrence, from Cape Breton to the Saguenay. Mean temperatures at special points have been: Mount Washington, 32°; Pike's Peak, 18°; Portland, Oreg., 57°; Portland, Me., 56°; San Diego, 60°; Charleston, 69°; Brownsville, Tex., 81°; Pembina, 57°. A comparison with the mean temperatures at the same stations since 1870 shows temperatures above the average in Minnesota, the Lake region, and New England, but below the average in the Lower Missouri and Ohio Valleys and the South and Middle Atlantic States.

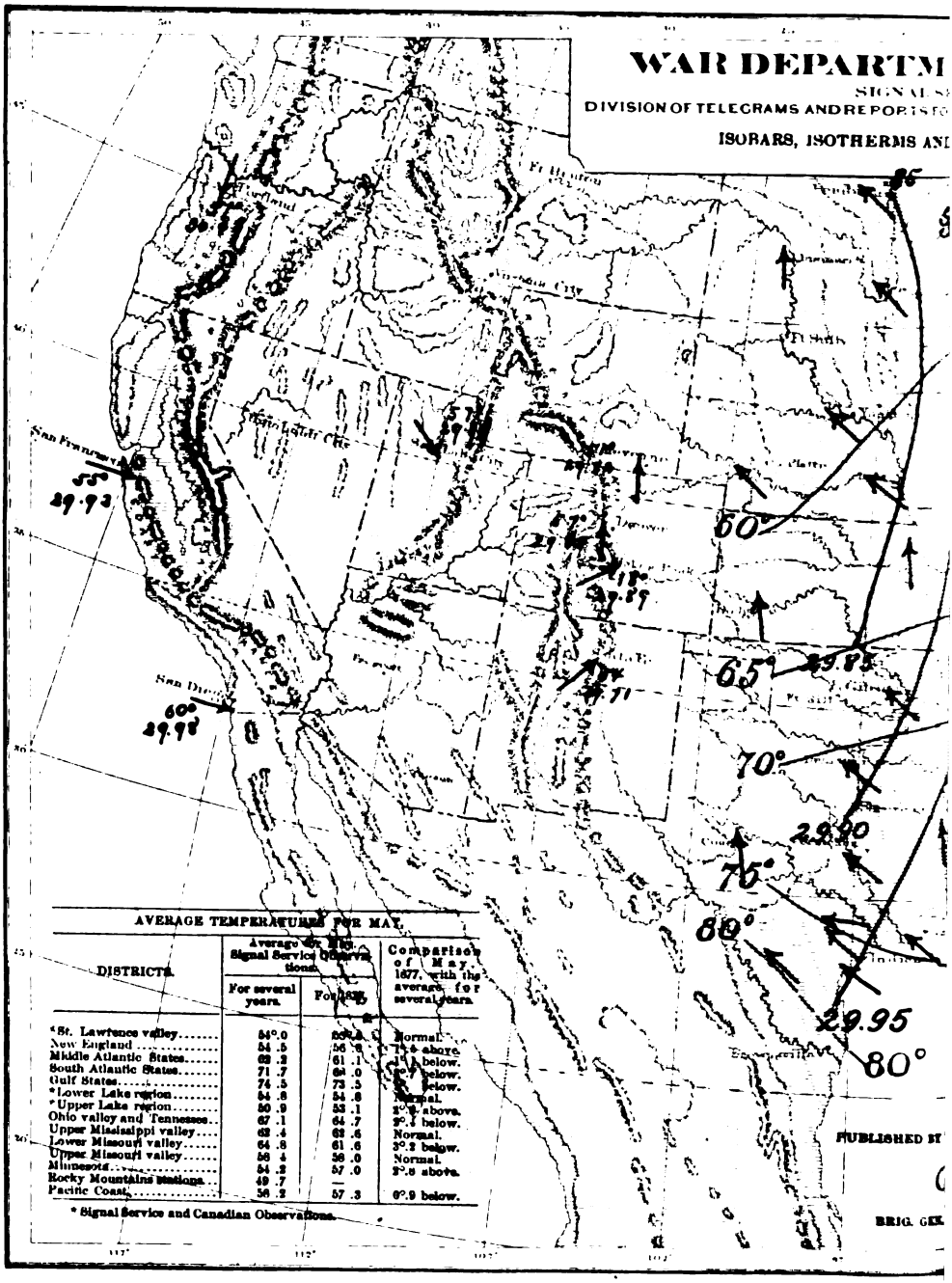
Maximum and minimum temperatures.—Maximum temperatures above 91°: 92° at Baltimore, 18th; Fort Gibson, 23d; Indianola, Memphis, 22d; New Orleans, 23d; Concho, 27th and 30th. 93° at Denison, 23d; Pittsburgh, 19th; Saint Mark's, 23d; Fort Whipple, 19th. 94° at Augusta, 22d; Knoxville, 18th; Lynchburg, 19th; Mobile, 23d; Savannah, —th. 95° at Corsicana, 21st; Montgomery, 22d; Vicksburg, 23d; San Antonio, 26th. 96° at Jacksonville, 23d; Norfolk, —th; Washington, 18th; Uvalde, —th. Minimum temperatures below 34°: 33° at Chicago, 2d; Grand Haven, 1st and 2d; Pittsburgh, 3d; Toledo, —th. 32° at Albany, —th; Bismarck, 3d; Buffalo, —th; Cleveland, 1st; Denver, 6th; Detroit, 2d; Erie, —th; North Platte, 7th; Rochester, 3d. 31° at Breckenridge, 4th; Burlington, 5th; Dubuque, 1st; Indianapolis, —th; La Crosse, 1st; Morgantown, 3d; Yankton, 1st. 30° at Milwaukee, 2d. 29° at Port Huron, 2d; Santa Fé, 4th. 27° at Alpena, 2d; Cheyenne, 6th; Duluth, —th; Pembina, 1st. 26° at Marquette, —th; Virginia City, 6th. 24° at Escanaba, 1st. 11° at Mount Washington, 3d. 1° at Pike's Peak, 6th.

It will be seen that a remarkable interval of high temperatures prevailed from the 17th to the 23d over a great part of the country east of the Mississippi, during which time the area of high barometer No. II was receding southeastward over the Atlantic States, and low barometer No. XI was moving eastward toward and over the Lake region.

Ranges of temperature.—The largest diurnal ranges are as follows: 37° at Breckenridge, 24th; Dodge City, 1st; Eastport, 29th; Santa Fé, 28th. 38° at Denver, 8th; Port Huron, 19th. 39° at North Platte, —; Boerne and Uvalde, 1st. 40° at Pembina, 24th. The largest monthly ranges have been: 56° at Alpena, Dubuque, Knoxville, Port Huron, Washington, Uvalde; 57° at Indianapolis; 59° at Morgantown; 60° at Pittsburgh; 64° at Marquette. The least monthly ranges have been: 33° at Cape Hatteras and Indianola; 34° at Cape Lookout and Pike's Peak; 35° at Cape May; 32° at Galveston; 27° at Key West and San Francisco.

Frosts have been reported as follows: 1st, Indiana (severe), Kentucky, Alabama, Georgia, Illinois, Iowa, Kansas, Mississippi (last), Missouri, Nebraska, North Carolina (severe), Ohio, Tennessee, Texas, Virginia, Wisconsin; 2d, Ohio, Michigan, Indiana (severe), Tennessee, Kentucky, Georgia, Illinois, Iowa, Massachusetts, New York, North Carolina (severe), Pennsylvania, Tennessee, Utah, Virginia, West Virginia, Wisconsin; 3d, Michigan, Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, Wisconsin; 4th, Indiana, New Mexico, Michigan, Ohio, Colorado, Delaware, Illinois, Missouri, Nebraska, New Jersey, New York, Pennsylvania, Vermont, Wisconsin; 5th, Connecticut, Michigan, Delaware. Kansas, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Vermont; 6th, Maine, New Hampshire, New York, Pennsylvania, Utah; 7th, Nebraska, Dakota, Connecticut, Iowa, Kansas (severe), Maryland, Massachusetts, Michigan, New Hampshire, New York, Pennsylvania; 8th, Maine, Illinois, Iowa, Kansas, New Hampshire, New York; 9th, Illinois, Indiana, Iowa, Michigan, New York, North Carolina, Ohio, Tennessee, Wisconsin; 10th, Ohio, Illinois, Indiana, Iowa, Maine, Maryland, Michigan, North Carolina (killing). Pennsylvania, South Carolina, Tennessee, Utah, Virginia, Wisconsin; 11th, Maine, Ohio, Delaware, Indiana, Michigan, North Carolina, Pennsylvania, Vermont, Virginia, West Virginia, Wisconsin; 12th, Delaware, Indiana, Maine, New Jersey, Ohio, Pennsylvania, Vermont, Wisconsin; 13th, Michigan, Ohio, Pennsylvania, Vermont; 14th, Wyoming, Maine, New York, Ohio; 18th, New Mexico; 20th, New Mexico; 21st, Maine, Illinois; 22d, Illinois; 23d, Michigan, Illinois, Utah (severe), Vermont, Wisconsin; 24th, Illinois, Indiana, Iowa, Michigan, New York, North Carolina, Ohio, Pennsylvania, Virginia, Wisconsin; 25th, Indiana, Illinois, Iowa, Maryland (heavy), New Jersey, New York, Ohio, Virginia, Wisconsin; 26th, Michigan, Illinois, Indiana, North Carolina, Ohio, Virginia; 27th, Illinois, New York; 28th, New York, Vermont; 29th, New York, North Carolina; 30th, North Carolina; 31st, New Mexico.

Ice.—The formation of ice, rather than frosts: 1st, North Carolina; 2d, North Carolina; 3d, Connecticut, West Virginia, Massachusetts; 10th, North Carolina; 25th, Virginia.

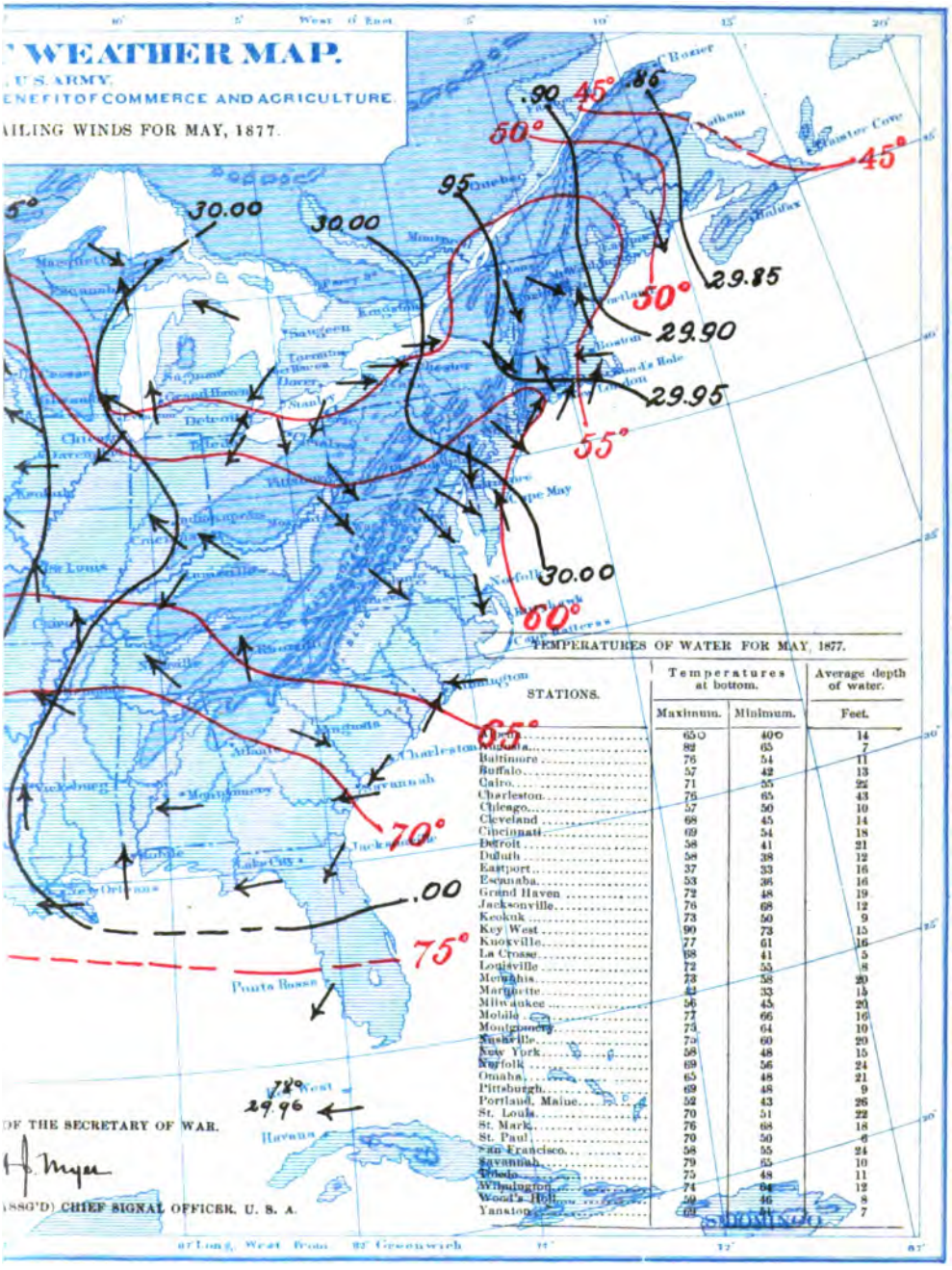


AVERAGE TEMPERATURES FOR MAY.

DISTRICTS.	Average for the Signal Service Observations. For several years.	For 1877.	Comparison of May, 1877, with the average for several years.
*St. Lawrence valley	54°.0	55°.3	Normal.
New England	54 .5	56 .8	1°.5 above.
Middle Atlantic States	62 .2	61 .1	1°.1 below.
South Atlantic States	71 .7	69 .0	2°.7 below.
Gulf States	74 .5	73 .5	1°.0 below.
*Lower Lake region	54 .8	54 .8	Normal.
*Upper Lake region	50 .9	53 .1	2°.2 above.
Ohio valley and Tennessee	67 .1	64 .7	2°.4 below.
Upper Mississippi valley	62 .4	62 .6	Normal.
Lower Missouri valley	64 .8	61 .6	3°.2 below.
Upper Missouri valley	56 .4	59 .0	Normal.
Minnesota	54 .2	57 .0	2°.8 above.
Rocky Mountains stations	49 .7	—	—
Pacific Coast	58 .2	57 .3	0°.9 below.

* Signal Service and Canadian Observations.

No. II.


WEATHER MAP.
U.S. ARMY.
BENEFIT OF COMMERCE AND AGRICULTURE.
SAILING WINDS FOR MAY, 1877.
30.00
30.00
95
.90
45°
.86
50°
45°
50°
29.85
29.90
29.95
55°
30.00
60°
65°
70°
.00
75°
78°
West
29.96
Punta Rassa
Havana
Quebec
Halifax
Chicago
Detroit
Cleveland
Buffalo
Toronto
Boston
New York
Philadelphia
Washington
Norfolk
Cape Hatteras
Charleston
Savannah
Mobile
New Orleans
Key West
Jacksonville
Montgomery
Vicksburg
St. Louis
Cape May
Portland
Bangor
Plaster Cove
Yarmouth
Cape Sable
Grand Manan
Anticosti
Escanaba
Grand Haven
Eastport
Duluth
Marquette
Milwaukee
Omaha
Pittsburgh
St. Louis
St. Mark
St. Paul
San Francisco
Savannah
Toledo
Wilmington
Wood's Holl
Yankton
TEMPERATURES OF WATER FOR MAY, 1877.
STATIONS.
Temperatures at bottom.
Maximum.
Minimum.
Average depth of water.
Feet.
Baltimore 76 54 11
Buffalo 57 42 13
Cairo 71 55 22
Charleston 75 65 43
Chicago 57 50 10
Cleveland 68 45 14
Cincinnati 69 54 18
Detroit 58 41 21
Duluth 58 38 12
Eastport 37 33 16
Escanaba 53 36 16
Grand Haven 72 48 19
Jacksonville 76 68 12
Keokuk 73 50 9
Key West 90 73 15
Knoxville 77 61 16
La Crosse 68 41 5
Louisville 72 55 8
Memphis 73 58 20
Marquette 43 33 15
Milwaukee 56 45 20
Mobile 77 66 16
Montgomery 73 64 10
Nashville 73 60 20
New York 68 48 15
Norfolk 69 56 24
Omaha 65 48 21
Pittsburgh 69 48 9
Portland, Maine 52 43 26
St. Louis 70 51 22
St. Mark 76 68 18
St. Paul 70 50 6
San Francisco 58 55 24
Savannah 79 65 10
Toledo 72 48 11
Wilmington 74 54 12
Wood's Holl 56 46 8
Yankton 69 41 7
OF THE SECRETARY OF WAR.
(BRIG'D) CHIEF SIGNAL OFFICER, U. S. A.

PRECIPITATION.

In general.—The general distribution of rain and melted snow for May is shown on Chart No. III, from which it will be seen that the region of largest rain-fall extends from Central Texas northward to Manitoba, with small areas of large rain-fall in Southern Florida and the coast of the Canadian Provinces. This distribution of rain-fall for May appears to be quite anomalous, nothing similar having occurred during the last six years, the nearest approach to it being May, 1874, when narrow belts of heavy precipitation extended from Indian Territory to Lake Huron, and also along the Atlantic coast; as a consequence, the rain-fall west of the Mississippi is largely in excess of the normal values; on the other hand, a large deficiency is reported from the Gulf and Atlantic States, the Ohio and Saint Lawrence Valleys, and the Lake region. A deficiency is also noted in the greater part of California, which, by the 10th of June, had caused a severe drought in many sections, although sufficient fell on the west slopes of mountain ranges.

Heavy special rains.—Dodge City, 24th and 25th, 2.15 inches. Denison, 2d, 2.07. Duluth, 19th to 21st, 4.30. Fort Sill, 19th and 20th, 2.83. Leavenworth, 16th, 2.40; 31st, 2.30. Omaha, rained more or less every day from the 10th to the 20th, inclusive, during which time 4.57 inches fell; 31st, 2 24. Saint Paul, 30th and 31st, 3.31. Saint Augustine, Fla., 27th, 10 a. m., to 28th, 7 a. m., 6.50. Fort Snelling, Minn., 20th, 3.34; 30th, 4.30; 31st, 5.12. Golden, Colo., 2d, 5th, and 6th, snow-fall 10¼. Belvidere, Ill., 20th, 1 03 rain-fall in twenty minutes. Manhattan, Kans., 19th, 3 inches during the night. Creswell, Kans., 12th, 3 inches; 18th, 3.23. Austin, Tex., 6th, 3 inches in the morning.

Small monthly rain-falls.—The following stations report less than one-half inch of rain during the month: San Diego, 0.43; San Francisco, 0.18; Eagle Pass, 0.43; Florence, 0.31; Tucson and Maricopa Wells, 0.41; Saugeen, 0.26; Yuma, 0.06; Salinas City, Cal., 0.20; Forsyth, Ga., 0.45; Palermo, N. Y., 0.40; Nile, N. Y., 0.45; Ruggles, Ohio, 0.25; Hudson, Ohio, 0.25; Salem, Ohio, 0.35; Franklin, Penn., 0.47; Strafford, Vt., 0.4; Tusculum, Tex., 0.51 (the smallest for many years.)

Large monthly rain-falls.—Rain to the amount of seven inches or more fell during the month at the following stations: Duluth and Fort Sill, 7.24; Leavenworth, 8.67; Omaha, 8.62; Saint Augustine, Fla., 9.95; Fort Snelling, Minn., 14.48; Creswell, Kans., 11.81; Sedgwick, Kans., 16.37; Springfield, Mo, 8.55; Clear Creek, Nebr., 10.87; Howard, Nebr., 10.05.

Droughts.—Droughts, injurious to vegetation, have been reported as follows: California, droughts in the interior, but abundant rains on the coast side of the mountains. Florida, severe droughts, but crop not yet injured. Illinois, strawberry-crop shortened one-third by drought. Southern Indiana, vegetation suffering for want of rain. Ohio, very dry; corn and oats need rain. Tennessee, smallest rain-fall for many years; gardens are suffering. South Carolina (York County), no rain throughout the month; crops all suffering.

Hail-storms.—Special notes of hail-storms have been received from 93 stations, on 29 days, distributed as follows: On the 1st, New York; 2d, Kansas; 3d, Texas; 4th, New York; 5th, Texas, South Carolina, Tennessee, Montana; 6th, Texas, Florida; 7th, Alabama, Texas; 8th, South Carolina; 9th, Nevada, North Carolina; 11th, Nevada, Utah, Texas; 12th, Texas; 14th, Dakota, North Carolina; 15th, Minnesota, Nebraska, Tennessee; 16th, California, Colorado, New York; 17th, Iowa, Massachusetts, Nebraska; 18th, Nebraska, California, Connecticut, New York, Rhode Island, Vermont; 19th, Dakota, Texas; 20th, Nevada, Indiana; 21st, Nevada, Illinois, Maryland, New Jersey, Pennsylvania, Tennessee, West Virginia; 22d, Nevada, Delaware, New Jersey, Pennsylvania, Nebraska, Texas; 24th, Texas, New York; 25th, New Jersey, New York, Colorado; 26th, New Jersey, Pennsylvania; 27th, Maryland, Nebraska, Texas; 28th, Dakota, Nebraska, Texas; 29th, Illinois, Kansas, Colorado, Dakota, Nebraska; 31st, Dakota, Kansas, Utah, Iowa, Minnesota, Missouri, Nebraska, Illinois.

Large hail-stones.—Among the cases of large hail-stones are the following: 3d, terrific and destructive storm near Mason, Tex., hail as large as a man's hand, crushing crops and killing thousands of sheep; 4th, near Mendon, Mass.; 7th, in Sabine County, Texas, 2.6 inches diameter, 3 to 4 inches long; 14th, at Bismarck, Dak., hail-stones 1.7 inches long, 1 inch wide (see Loomis, p. 131, fig. 54). 18th. The local storms and tornadoes of the 18th, elsewhere described, were accompanied by large hail, as follows: Cranston, R. I., 1 inch in diameter; Pascoag, R. I., 1½ inches; Brookfield, Mass., 1 inch; Webster, Mass., 3 inches; Oxford, Mass., 4 inches; Bennington, Vt., 5 inches. 27th, 22 miles north of Mason, Tex., 3 to 4 inches diameter, crushing through roofs; at Fort McKavett, 1 inch diameter, very destructive.

Snow-fall.—Falls of snow have been reported as follows: 1st, Michigan, Ohio, Wyoming, Indiana, New York, West Virginia, Pennsylvania, Montana; 2d, Wyoming, Colorado, New York, Virginia; 3d, Wyoming, Virginia, Michigan; 4th, Montana; 5th, Wyoming, Colorado, Montana; 6th, Wyoming, Colorado; 7th, Montana; 8th, Montana; 9th, West Virginia, Montana; 10th, Maine, Vermont; 12th, Wyoming; 17th,

Utah, Montana; 18th, Utah; 19th, Wyoming, New Mexico; 23d, Nevada; 24th, New Jersey, New York, Massachusetts (4 inches in Berkshire County); 29th, Nevada; 30th, Wyoming; 31st, Wyoming, Montana.

Rainy days.—The number of days during the month on which rain has fallen, as reported by the Signal Service observers, ranges from 5 to 17 in New England; 9 to 14 in the Middle Atlantic States; 5 to 14 in the South Atlantic States; 3 to 13 in the Gulf States; 5 to 15 in the Ohio Valley and Tennessee: 6 to 11 in the Lower Lake region; 4 to 11 in the Upper Lake region; 9 to 27 in the Northwest; 8 to 22 at the Rocky Mountain stations; 3 in Arizona; 10 at San Diego; 1 at San Francisco, and 16 at Portland, Oreg.

Cloudy days.—The number of cloudy days during the month, as reported by the voluntary and Army surgeon observers, ranges as follows: New England, 5 to 12; Middle States, 3 to 13; South Atlantic States, 0 to 8; Gulf States, 0 to 10; Tennessee and the Ohio Valley, 2 to 13; Upper Lake region, 1 to 9; Northwest, 2 to 18; Colorado, Wyoming, Utah, and Idaho, 4 to 9; California, 1 and 2.

RELATIVE HUMIDITY.

The average relative humidity for the month ranges from 69 to 75 per cent. at the stations on the immediate coast of North Carolina, New Jersey, and New England; other stations in the Atlantic States, 54 to 69; Gulf States, 53 to 73; Ohio Valley and Tennessee, 56 to 62; Lake region, 54 to 68; Northwest, 52 to 72; Rocky Mountain stations (excepting Pike's Peak), 33 to 61; Pacific Coast, 65 to 73.

WINDS.

The prevailing directions of the wind are shown by the arrows on Chart No. II, from which it will be seen that the south and southeast winds have corresponded throughout the interior of the country very nearly to the distribution of barometric pressure.

Total movements.—Largest: Pike's Peak, 17,483; Dodge City, 11,998; Cape Lookout, 11,598; Cape May, 10,357; Breckenridge, 10,301. Smallest: Portland, Oreg., 2,394; Lynchburg, 2,569; Shreveport, 2,771; Augusta, 2,955.

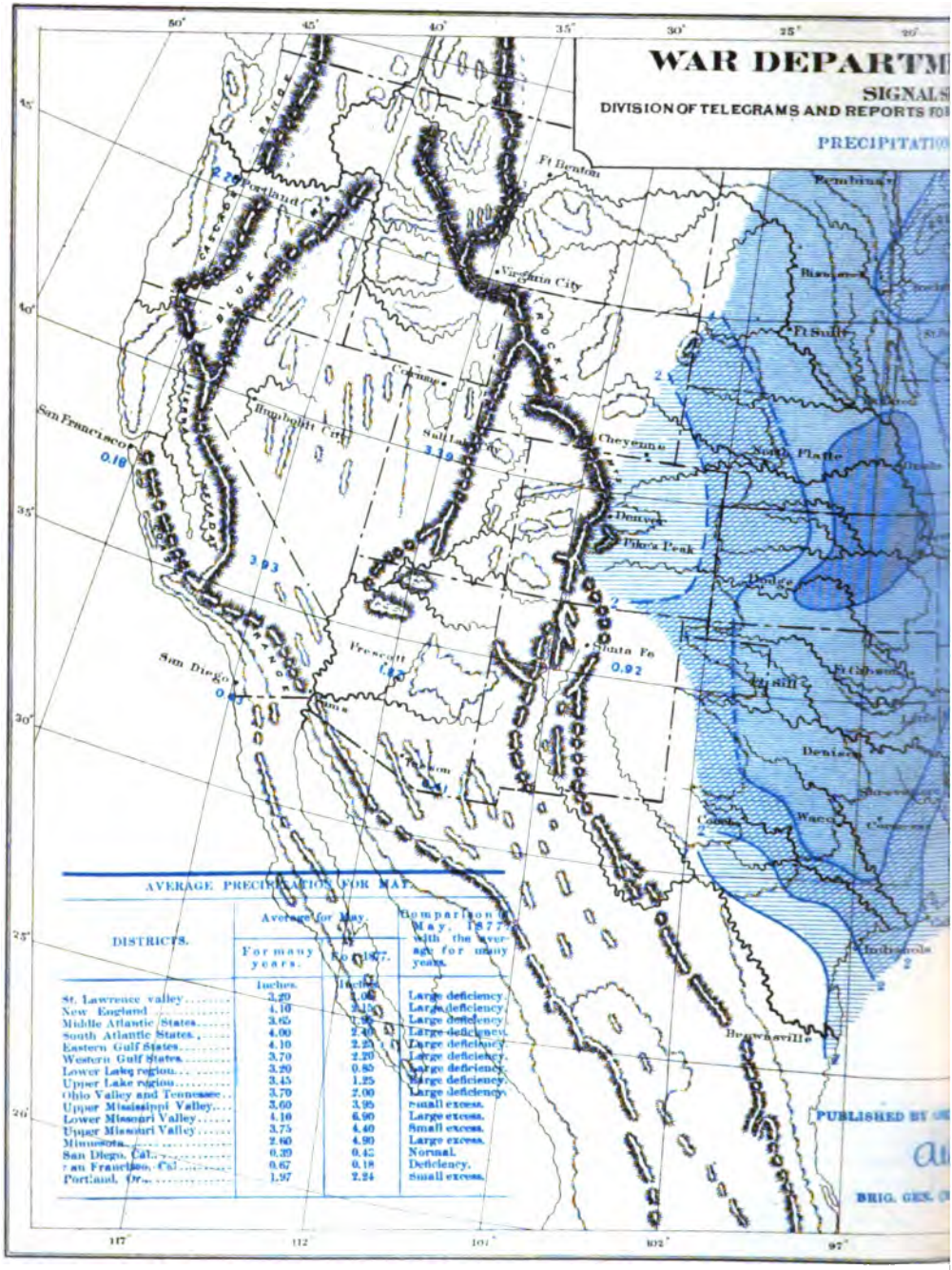
Highest winds.—The highest velocities in miles per hour have been: 126 at Mount Washington; 84 at North Platte; 70 at Pike's Peak; 60 at Cape Henry and Duluth.

Local storms, tornadoes, &c., are reported as follows: 6th, a tornado passed over Saint Mark's, Fla., at 1.50 p. m., demolishing several houses, chimneys, &c.; another occurred in Sabine, Tex. 14th a whirlwind at Eastport, Me. 18th, tornadoes at Saint Hyppolite, Canada, and near Quebec. The tornado of the 18th, passing from Saratoga County, New York, southeastward into Bennington County, Vermont, was especially destructive at Argyle and Cambridge, N. Y., and Bennington County, Vermont; the average width of the destructive wind and hail is said to have been less than 2 miles, and its length about 50 miles; hail-stones of 5, 6, and 8 inches in circumference and weighing 4 ounces were picked up, and the very heavy rain accompanying it did additional damage; it began about 1 p. m., and probably ended about 3 p. m., in Vermont. 20th, Marion, Ind., and Black Earth, Wis., severe storms. 21st, Key West, Fla., water-spout half mile northwest of station. 22d, Wythville, Va., severe wind-storm. 26th, Boerne, Tex., violent tornado. Sand-storm at Yuma, Ariz., on the 28th, and "terrific" sand-storm on the 29th. On the 16th to 19th the unusual occurrence is noted of a very heavy "Kona" storm and rain over the Sandwich Islands; heavy snow fell on the mountains, and a large water-spout was observed at Honolulu. (The "Kona" is a strong northerly wind, interrupting the regular northeast trade, and usually preceding a hurricane.) 30th, Saint Paul, Minn., violent storm.

VERIFICATIONS.

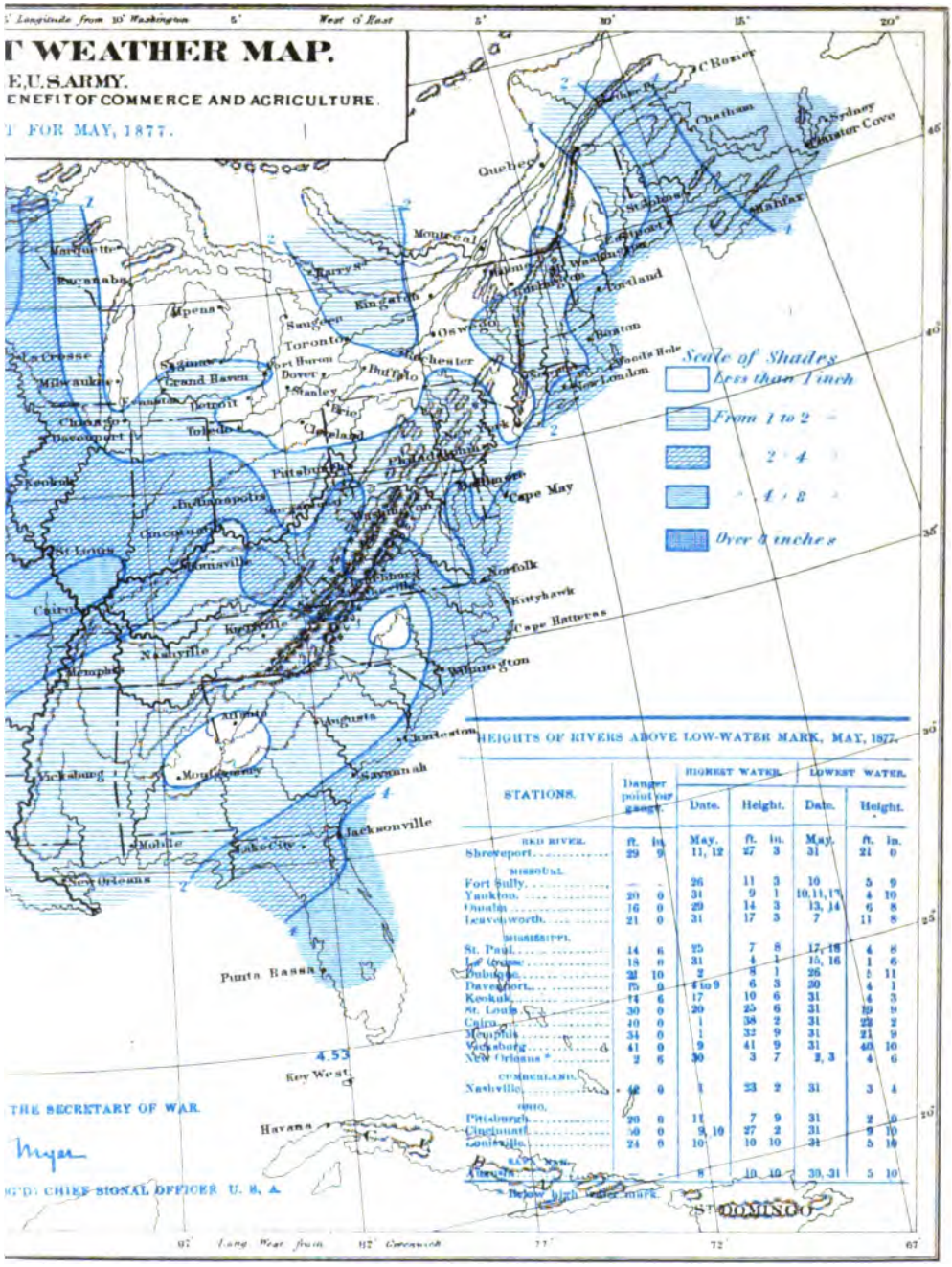
Indications.—The detailed comparison of the tri-daily weather indications with the telegraphic weather reports for the succeeding 24 hours, shows a general percentage of omissions of 0.1 per cent., and of verifications of 85.9 per cent. Out of 3,713 predictions, 2,719, or 73.3 per cent., have been fully verified; 292, or 7.9 per cent., have been three-fourths verified; 459, or 12.4 per cent., have been one-half verified; 83, or 2.3 per cent., one-fourth verified; 160, or 4.4 per cent., have failed. The percentages for the four elements have been: Weather, 94.4; wind, 87.5; temperature, 84.1; barometer, 77.6. The percentages of verifications by geographical districts have been: New England, 84.7; Middle Atlantic States, 87.0; South Atlantic States, 85.4; East Gulf States, 88.8; West Gulf States, 88.3; Lower Lakes, 86.4; Upper Lakes, 82.5; Tennessee and the Ohio Valley, 87.9; Upper Mississippi Valley, 83.7; Lower Missouri Valley, 83.8.

Cautionary signals.—During the month 83 cautionary signals have been displayed at stations on the Gulf and Atlantic coasts and the Lakes. Of these, 49, or 59 per cent., were justified by subsequent high winds within one hundred miles of the stations where



AVERAGE PRECIPITATION FOR MAY.

DISTRICTS.	Average for May. For many years.	Average for May, 1877.	Comparison of May, 1877, with the average for many years.
	Inches.	Inches.	
St. Lawrence valley	3.29	1.06	Large deficiency.
New England	4.10	3.13	Large deficiency.
Middle Atlantic States	3.65	1.95	Large deficiency.
South Atlantic States	4.00	2.40	Large deficiency.
Eastern Gulf States	4.10	2.23	Large deficiency.
Western Gulf States	3.70	2.20	Large deficiency.
Lower Lake region	3.20	0.85	Large deficiency.
Upper Lake region	3.45	1.25	Large deficiency.
Ohio Valley and Tennessee	3.70	2.00	Large deficiency.
Upper Mississippi Valley	3.60	3.95	Small excess.
Lower Missouri Valley	4.10	6.90	Large excess.
Upper Missouri Valley	3.75	4.40	Small excess.
Minnesota	2.60	4.90	Large excess.
San Diego, Cal.	0.39	0.45	Normal.
San Francisco, Cal.	0.67	0.18	Deficiency.
Portland, Or.	1.97	2.24	Small excess.



HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, MAY, 1877.

STATIONS.	Danger point for gauge.		HIGHEST WATER.			LOWEST WATER.		
			Date.	Height.		Date.	Height.	
RED RIVER.	ft.	in.	May.	ft.	in.	May.	ft.	in.
Shreveport	29	9	11, 12	27	3	31	21	0
MISSOURI.								
Fort Sully	—	—	26	11	3	10	5	9
Yankton	20	0	31	9	1	10, 11, 17	4	10
Omaha	16	0	29	14	3	13, 14	6	8
Leavenworth	21	0	31	17	3	7	11	8
MISSISSIPPI.								
St. Paul	14	6	25	7	8	17, 18	4	8
La Crosse	18	0	31	4	1	15, 16	1	6
Dubuque	22	10	2	8	1	26	5	11
Davenport	15	0	4 to 9	6	3	20	4	1
Keokuk	14	6	17	10	6	31	4	3
St. Louis	30	0	20	25	6	31	19	9
Cairo	40	0	1	38	2	31	22	2
Memphis	34	0	1	32	9	31	21	9
Vicksburg	41	0	9	41	9	31	40	10
New Orleans *	2	6	30	3	7	2, 3	4	6
CUMBERLAND.								
Nashville	42	0	1	23	2	31	3	4
OHIO.								
Pittsburgh	20	0	11	7	9	31	2	10
Cincinnati	50	0	9, 10	27	2	31	9	10
Louisville	24	0	10	10	10	31	5	10
RED RIVER.								
Alexandria	—	—	8	10	10	30, 31	5	10

* Below high water mark.

they were displayed, and 34, or 41 per cent., were not justified so far as known. Fifty-one instances of high winds, when no signals were displayed, have also been reported from these stations. Telegraphic communication with the North Carolina coast stations has been interrupted during the month.

NAVIGATION.

Stages of water.—In the table on Chart No. III is shown the highest and lowest readings on the river-gauges for the month. It will be seen that the lowest water in the Missouri and the extreme upper portion of the Mississippi occurred about the middle of the month, after which time these rivers rose until they reached their highest readings, at the close of the month. The lower portion of the Mississippi, as also the Ohio and its tributaries, and the Red River, all reached their lowest readings on the last day of the month. The Mississippi was slightly above the danger-line at Vicksburg from the 1st to the 23d. At Keokuk, on the 28th, navigation was obstructed by the very low stage of water; also at Pittsburgh on the 29th. At Cambridge, Tex., on the 21st, water was very high in the Red River. At Indianola, on the 16th, tide was 8 feet higher than usual. At Leavenworth, destructive freshet on the 18th, and river very high on 30th. At Creswell, Marion County, Kans., highest flood for many years. At Sedgwick, Kans., on the 19th, river rose 23 feet in 24 hours. Hutchinson, and other towns in Eastern Kansas, destructive freshet on the 20th, and subsequently.

Ice in rivers and opening of navigation.—The most interesting feature under this head relates to the ice blockade in Lake Huron, the northern end of which was open while the southern was closed; at Saint Clair Flats the blockade lasted from the 8th to the 15th, after having been open during the previous two weeks. At Fort Brady, Mich., ice was running in river from 7th to 14th. Navigation opened as follows: Erie Canal on the 8th. Marquette, 6th; heavy floating ice from the 1st to the 6th. The first vessel arrived at Oswego, N. Y., from Lake Michigan on the 11th.

TEMPERATURE OF WATER.

The temperature of the water in the rivers and harbors is shown by the table on Chart No. II. The highest temperatures are: 79° Savannah; 82° Augusta; 90° Key West. Lowest temperatures: 33° Eastport and Marquette; 36° Escanaba; 35° Duluth; 40° Alpena; 41° Detroit and La Crosse.

Largest ranges.—27° La Crosse; 24° Grand Haven; 23° Cleveland and Keokuk; 22° Buffalo; 21° Pittsburgh; 20° Duluth and Saint Paul.

Smallest ranges.—3° San Francisco; 4° Eastport; 7° Chicago; 8° Saint Paul; 9° Marquette, Portland, Me.

ATMOSPHERIC ELECTRICITY.

Thunder-storms or diffuse lightning are reported: 1st, Massachusetts, Tennessee; 2d, Colorado, Dakota, Kansas, Missouri, Texas, Vermont; 3d, Indian Territory, Louisiana, Mississippi, Texas, Tennessee; 4th, Dakota, Illinois, Iowa, Indian Territory, Louisiana, Massachusetts, Mississippi, South Carolina, Texas; 5th, Florida, Georgia, Kansas, Kentucky, Mississippi, North Carolina; 6th, Florida, Georgia, Louisiana, Mississippi, South Carolina, Tennessee, Texas; 7th, Alabama, Florida, Illinois, Mississippi, New Mexico, Texas (lightning); 8th, Indiana, North Carolina, Nebraska; 9th, Dakota, Maryland, Nebraska, Texas; 10th, Colorado, Dakota, Illinois, Kansas, Missouri, Nebraska, Texas; 11th, Alabama, Florida, Indian Territory, Kansas, Texas; 12th, Alabama, Georgia, Illinois, Kansas, Louisiana, Mississippi, Missouri, Tennessee, Texas; 13th, Colorado, Georgia, Illinois, Indian Territory, Mississippi, Tennessee, Texas, Utah; 14th, Colorado, Dakota, Florida, Illinois, Indiana, Indian Territory, Kansas, Mississippi, Missouri, Nebraska, North Carolina, South Carolina, Tennessee, Texas, Wisconsin; 15th, California, Dakota, Florida, Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Nebraska, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Texas, Wisconsin; 16th, Connecticut, Dakota, Illinois, Iowa, Kansas, Massachusetts, Maryland, Maine, Michigan, Minnesota, Missouri, Nebraska, New Jersey, New York, Pennsylvania, Tennessee, West Virginia; 17th, Connecticut, Dakota, Illinois, Iowa, Massachusetts, Maine, Nebraska, New Jersey, New York, Pennsylvania, Wisconsin; 18th, Connecticut, Florida, Iowa, Kansas, Maine, Nebraska, New York, Rhode Island, Texas, Vermont; 19th, Dakota, Florida, Georgia, Kansas, Minnesota, Missouri, Nebraska, Texas, Virginia; 20th, District of Columbia, Dakota, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Michigan, Mississippi, Minnesota, Missouri, North Carolina, New Jersey, Ohio, Pennsylvania, Texas, Virginia, West Virginia, Wisconsin; 21st, Alabama, Connecticut, District of Columbia, Dakota, Delaware, Georgia, Indiana, Kansas, Maryland, Michigan, North Carolina, New Jersey, New York, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, West Virginia; 22d, Connecticut, Delaware, Georgia, Kansas, Massachusetts, Maryland, Missouri, Nebraska, North Carolina, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Tennessee, Texas. Vermont, Virginia, West Virginia; 23d, Colorado, Dakota, Florida, Kansas, Maine, Missouri, North Carolina,

Nebraska, Texas; 24th, Colorado, Kansas, Maine, New York, Texas, Vermont, Wyoming; 25th, Colorado, New Jersey, Texas, Vermont, Wyoming; 26th, Florida, Nebraska, New Jersey, Pennsylvania, Texas; 27th, Missouri, Nebraska, New Jersey, Texas; 28th, Connecticut, Dakota, Minnesota, Mississippi, Nebraska, Texas; 29th, Dakota, Illinois, Minnesota, Nebraska, Texas; 30th, Colorado, Connecticut, Dakota, Illinois, Indian Territory, Iowa, Kansas, Massachusetts, Michigan, Maine, Nebraska, New Jersey, New York, Wisconsin; 31st, Dakota, Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, Wisconsin.

Telegraphic ground currents were reported at Santa Fé on the 23d and 24th. Strong currents also prevailed in the Middle and Eastern States during the aurora of the 28th. At Pike's Peak on the 12th and 24th.

Auroras.—The auroras of the month of May have been more numerous and brilliant, and more extensively observed, than for some years past. They have been reported from three hundred and thirty stations, on seventeen dates, distributed as follows (the numbers following the name of each State express the number of reports received): 1st, Iowa, 1. 2d, New Jersey, 10; Michigan, 7; Dakota, 3; Massachusetts, 10; New York, 7; Pennsylvania, 7; Virginia, 3; West Virginia, 1; Connecticut, 3; Rhode Island, 1; District of Columbia, 1; Nebraska, 1; Illinois, 1; Iowa, 2; Maryland, 3; Minnesota, 1; New Hampshire, 2; Ohio, 2; Vermont, 1; Wisconsin, 4. 3d, Massachusetts, 2; Minnesota, 2; Michigan, 3; Nevada, 1; Michigan, 1; Delaware, 1; Iowa, 1; New Hampshire, 1; New Jersey, 1; Ohio, 1; Wisconsin, 3. 4th, New York, 1; Michigan, 1; Massachusetts, 1. 7th, Kansas, 1. 9th, Wisconsin, 1. 10th, Maine, 2; Michigan, 1; New Jersey, 1. 11th, Michigan, 2; Maine, 3; New Hampshire, 2; New York, 1. 12th, New Hampshire, 1; New York, 1. 13th, Maine, 1; Massachusetts, 1. 16th, New York, 1. 18th, New York, 1. 21st, New York, 1. 28th, New Jersey, 12; New York, 25; Michigan, 9; Massachusetts, 14; Vermont, 5; Ohio, 14; Illinois, 8; Virginia, 6; Iowa, 40, of which 28 are due to the kind co-operation of Prof. J. Hinrichs; Pennsylvania, 8; Maine, 7; Indiana, 7; Tennessee, 2; North Carolina, 2; Kentucky, 1; Wisconsin, 2; West Virginia, 1; New Hampshire, 2; Connecticut, 2; Rhode Island, 2; Missouri, 1; District of Columbia, 1; Dakota, 1; Delaware, 1; Kansas, 1; Maryland, 5; Minnesota, 1. 29th, Ohio, 2; New York, 4; Virginia, 1; Wisconsin, 1. 30th, Maine, 4; New York, 1; Wisconsin, 1. 31st, Minnesota, 2.

The large number of reports relative to the brilliant aurora of the 28th, render this especially interesting. The following preliminary account is all that need at present be given. It was visible from Maine on the east to Kansas and Dakota on the west, and as far south as North Carolina and Kentucky. At Washington three arches were seen in the northern heavens, the altitude of the upper one being about 23°, with streamers to 45°. At Vevay, Ind., the arches rose to the altitude of 45° and streamers to the zenith; the magnetic compass needles were in constant agitation, oscillating through an arc of 3°. Throughout Eastern Iowa the heavens appeared illuminated by streams from the north passing to the zenith. At Cambridge and Waltham, Mass., arches reached to the zenith, and fragments formed to the south. At Grand Haven, Mich., the streamers and light extended from east and west through the zenith. At Detroit, Mich., three arches were seen at altitudes of 45°, 65°, and 90°; also a corona near the zenith, and streamers and light 10° south of zenith; the three arches were continually moving upward or southward and back again, reaching sometimes 15° south of zenith. At Adrian, Mich., two arches first appeared, then a third one at or south of zenith, from east to west; similar phenomena was seen throughout Michigan. In Connecticut streamers flashed near to the zenith. In Illinois and Indiana observers generally report no true arch, but only waves, clouds, and streamers of light. At Gardiner, Me., a beam from east to west reached the zenith. New Jersey, two arches seen, the second indefinite and within the first. Central New York, arches from east to west through the zenith, and two or three others lower down toward the north; a fine corona was observed at Cazenovia, North Volney, Oneida, and North Argyle; at New York City the altitudes of the arches were 45°, with streamers to the zenith. In Ohio telegraph-lines were affected with ground currents, and one and sometimes two perfect arches were observed, with streamers reaching 75° altitude. Vermont, one of the most brilliant ever seen; corona was seen at Newport. Wisconsin, corona was seen at Manitowoc, Neillsville, and Rocky Run. The electric disturbance on telegraph-wires was sufficient to interrupt the ordinary business between New York, Buffalo, Baltimore, Montreal, and Washington.

OPTICAL PHENOMENA.

Solar halos.—1st, Indiana, New Jersey, New York; 2d, Illinois, Indiana, Iowa, Minnesota, Ohio, Wisconsin; 3d, Delaware, Maryland, New Jersey, New Mexico, Ohio, Pennsylvania, Virginia, Vermont; 4th, Georgia, Iowa, Maine, Nebraska, New Hampshire, Ohio, South Carolina; 5th, Indiana, Iowa, Massachusetts, New Jersey, New York, Ohio, Rhode Island, Wisconsin; 6th, Colorado, Connecticut, Maine, Massachusetts, New Hampshire, New York; 7th, Minnesota, New Jersey, New Mexico, Wyoming; 8th, Connecticut, Iowa, Massachusetts, Michigan, Nebraska, New Hampshire, Ohio, Rhode

Island; 9th, New York; 10th, Alabama, Florida, Illinois, Kansas, Kentucky, Mississippi New York; 11th, Iowa, New York, Wisconsin; 12th, Connecticut, Indiana, Iowa, Massachusetts, New York, Ohio, Rhode Island, Wisconsin; 13th, Indiana, Maine, New Jersey, Ohio, Wyoming; 14th, Alabama, Indiana, Kentucky; 15th, Alabama, Dakota, Indiana, Iowa, Louisiana, New York, Ohio; 16th, Florida, Indiana, Iowa, New York, Tennessee, Wisconsin; 17th, Georgia, Illinois, Indiana, Massachusetts, New Jersey, New York, Ohio; 18th, Connecticut, Illinois, Indiana, Mississippi, New York, Ohio, South Carolina, Wisconsin; 19th, Connecticut, Florida, Georgia, Illinois, Indiana, Michigan, New Hampshire, New York, Ohio, Wisconsin; 20th, Connecticut, Illinois, New Jersey, Rhode Island; 21st, Maine, New Hampshire; 22d, Illinois; 23d, Texas; 24th, Alabama; 25th, Nebraska; 26th, New Hampshire; 28th, Connecticut, Illinois, Michigan, Wisconsin; 29th, Nebraska; 30th, Illinois; 31st, Connecticut, Massachusetts, New York, Rhode Island.

Lunar halos.—2d, Iowa, Missouri; 5th, New York; 14th, Indiana; 15th, Iowa, Michigan, New Jersey, Pennsylvania; 16th, Indiana, Kentucky, New Jersey, Ohio; 17th, Connecticut, Georgia, Illinois, Indiana, Iowa, Maine, Massachusetts, New Jersey, North Carolina, Texas, Wisconsin; 18th, Alabama, Illinois, Indiana, Iowa, Louisiana, Michigan, Missouri, New Jersey, New York, Tennessee, Wisconsin; 19th, Delaware, Indiana, Maine, Michigan, Minnesota, New Jersey, New York, Ohio, Pennsylvania, Texas, Utah, Virginia; 20th, Mississippi, Missouri, New Jersey, New York, Virginia; 21st, Colorado, Michigan, Missouri, Texas; 22d, Kansas, Missouri, Nebraska, Texas, Virginia; 23d, Iowa, Missouri, Texas; 24th, Alabama, Missouri; 25th, Minnesota; 27th, Georgia, Iowa; 28th, Florida; 29th and 30th, Louisiana.

Mirage.—Tybee Island, Ga., 1st, 8th; Duluth, Minn., 8th, 23d, 24th; New Bedford, Mass., 25th; Barnegat, N. J., 31st.

Scintillation of stars.—No observations of scintillation have been received for May.

MISCELLANEOUS PHENOMENA.

Zoological.—Botanical.—The blooming and ripening of fruits only have been reported: *Apple* in bloom on the 5th in Connecticut; 19th, Georgia; 7th and 13th, Illinois; 7th, 13th, and 17th, Iowa; 19th and 31st, Maine; 16th, 17th, and 21st, Massachusetts; 13th, Missouri; 2d, Nebraska; 4th, New Jersey; 15th, New Hampshire; 21st and 30th, New York; 6th, 7th, 8th, 13th, 14th, and 15th, Ohio; 14th and 22d, Pennsylvania; 19th, Vermont; 18th, Wisconsin. *Asparagus* ripe, 1st, Massachusetts. *Cherry* in bloom, 1st, 7th, 11th, 12th, and 13th, Massachusetts; 4th, Connecticut; 14th, 15th, and 18th, New York; 1st, Ohio; 8th, Pennsylvania; 16th, Vermont; ripe, 22d, Mississippi. *Currants* in bloom, 6th, Massachusetts. *Peach* in bloom, 6th, Connecticut; 3d and 13th, Massachusetts; 19th, New York; 2d, 11th, and 15th, Ohio; ripe, 30th, Texas. *Pear* in bloom, 4th, Illinois; 16th, Maine; 10th, 13th, 14th, and 17th, Massachusetts; 17th, New Hampshire; 18th, 19th, and 21st, New York; 9th and 18th, Pennsylvania. *Plum* in bloom, 18th, Illinois; 11th and 13th, Iowa; 3d and 13th, Massachusetts; 19th, New York; 18th, Pennsylvania; 15th and 18th, Vermont; 12th, Wisconsin; ripe, 22d, Mississippi. *Quince* in bloom, 26th, Massachusetts; 9th, New Jersey; 18th, Ohio; 19th, Pennsylvania. *Blackberries* in bloom, 20th, New Jersey; ripe, 10th, Texas. *Almond* in bloom, 2d, Nebraska. *Strawberries* in bloom, 1st, New Jersey.

BIRDS.—The first arrival and their migrations are reported as follows: *Blackbirds*, 3d, Kansas. *Bluejays*, 5th, Kansas. *Bobolinks*, 18th, Iowa; 15th, Maine; 13th and 15th, Massachusetts; 14th, New York. *Cuckoos*, 19th, New Jersey. *Ducks*, 30th, Dakota; 19th, Massachusetts, northwest, and 22d, northeast. *Geese*, 3d, 4th, 5th, and 6th, Nebraska, north; 15th, Minnesota, north. *Kingbirds*, 7th, Nebraska; 12th, Ohio. *Martins*, 2d, Wisconsin. *Nighthawks*, 16th, Iowa. *Orioles*, 1st, Maine; 10th and 14th, Massachusetts; 12th, Nebraska; 12th and 15th, New York; 12th, Ohio; 14th, Vermont; 17th, New Jersey. *Robbins*, with young, 15th, New York. *Swallows*, 7th, Maine; 6th, Massachusetts; 9th, Nebraska; 1st, 14th, and 16th, New York; 3d, Ohio; 8th, Utah; 6th and 7th, Vermont; 14th, Virginia. *Yellowbirds*, 8th and 10th, Massachusetts; 17th, New York. *Whip-poor-wills*, 19th, Iowa; 14th, Massachusetts; 1st, Ohio.

INSECTS.—*Grasshoppers*, flying at Camp Sheridan, Nebr., north 28th, northeast 29th; 2d, still hatching out at Creswell, Kans., and at Corning, Mo.; 1st to 22d, hatching out at Clear Creek, Nebr.; at Howard, Nebr., have hatched out during the month, and, although heavy rains have destroyed many, they are still damaging crops; 27th, at Melissa, Tex., brought thither by west winds; left same at noonday; Mesquite, Tex. (no date), damaging crops; 14th, Fort Gibson, Ind. T., disappeared, drowned out by heavy rains; 29th, North Platte, flying north; Omaha, injured by cold rains; many destroyed by the farmers; injuring crops somewhat; 28th, coming out of the ground at South Orange, N. J.; 30th, appeared at Ardenia, N. Y.; 7th, 8th, and 9th, at Boerne, Tex., flying north, large swarm; 10th, all gone; 12th to 25th, Griffin, Tex., flying north, no damage done; Denison, Tex., hatched out rapidly the first three days in April; April 23d, began moving and destroying; May 15th, commenced flying northward, with southerly winds, their numbers steadily decreasing until the 26th, when they disappeared. *Colorado beetle.*—Destroying potato-crop at Milford, Ind.; doing much

damage at Litchfield, Mich.; destructive at Auburn, N. H.; 16th, South Orange, N. J.; 6th, Starkey, N. Y.; 13th, Morgantown, W. Va.; 20th, Flushing, N. Y.

FISHES.—*Sturgeon*, 3d, Lower Brule Agency, caught in Missouri River.

Polar bands.—Nebraska, Plattsmouth, 1st. Ohio, Carthagena, 2d, 3d, 12th, 13th, 18th, 23d, and 30th. Iowa, Monticello, 2d; Guttenberg, 3d and 25th: Iowa City, 4th, 10th, 26th to 31st; Nora Springs, 28th. Minnesota, Duluth, 3d: Maine, Eastport, 10th. Kentucky, Louisville, 17th and 31st. Georgia, Tybee Island, 17th. Louisiana, Point Pleasant, 18th. New Hampshire, Auburn, 23d. New York, Waterburgh, 27th. Illinois, Elmira, 28th. Virginia, Wytheville, 30th and 31st.

Sunsets.—The characteristics of the sky, as indicative of approaching fair or foul weather, have been observed daily at sunset at all Signal-Service stations. The monthly means from 100 stations show that 74 doubtful cases, or blanks, were recorded, and that out of the remaining 2,712 cases, 2,158, or 79.5 per cent. have been followed by the expected weather.

Prairie and forest fires.—Near Wytheville, W. Va., 1st, 2d; Oregon, Mo., 1st, 4th; Monticello, Iowa, 4th; Clear Creek, Nebr., 4th, 9th; Brookhaven, N. Y., 7th; Wappinger's Falls, N. Y., 7th, 12th, 13th, 14th; Omaha, Nebr., 8th, 9th; Marquette, Mich., 9th, 11th, 29th; Burlington, Vt., 11th; Eastport, 11th, 12th, 15th, 16th; Duluth, Minn., 12th; Grand Rapids, Mich., 13th; in northern New York, 12th to end of month; Alpena, Mich., and in New Brunswick, 14th; Portland, Me., 14th, 15th, 16th; Springfield, Mass., White Mountains, N. H., and Nile, N. Y., 15th; Mount Desert, Me., and Adirondack Mountains, 16th; Fall River, Mass., 17th; Escanaba, Mich., 17th, 23d (town in great danger), 29th, 31st; Portsmouth, N. C., 20th; 31st, for several days extensive forest-fires have been raging in Marquette, Saint Clair, and Lapeer Counties, Mich., and the towns of Onata, Schoolcraft County, and Greenwood, Ogemaw County, were entirely destroyed.

Meteors.—1st, North Volney, N. Y.; Jacksonburgh, Ohio. 5th, Stockton, Tex. 10th, Jacksonburgh, Ohio. 11th, Tybee Island; Lyndon, Ill.; Wilmington, N. C. 12th, Tybee Island; Salem, N. J. 17th, Breckenridge. 20th, Jacksonburgh, Ohio. 21st, Leavenworth. 22d, Oregon, Mo.; Embarass, Wis. 25th, Starkey, N. Y. 27th, Woodstock, Md. 28th, Woodstock, Md.; Carthagena, Ohio. 29th, Monticello, Iowa.

Zodiacal light was observed as follows: Southington, Conn., 3d, 4th, 6th, 7th, and 12th; Monticello, Iowa, 1st, 4th, 5th, 6th, 7th, 8th, 10th, 11th; Cambridge, Mass., 8th; Adrian, Mich., 3d, 6th, 11th; Atco, N. J., 4th, 12th, 13th, 14th; Waterburgh, N. Y., 4th, 6th; Wytheville, Va., 1st, 9th, 10th; Savannah, Ga., 1st, 2d, 3d, 5th, 7th, 8th, 9th, 10th, 11th, 13th, 14th, 15th, 16th, 29th, 30th, 31st; Tybee Island, Ga., 12th, 14th, 31st.

Earthquakes have been reported as follows: On the 2d, Oshawa, Canada West, at 10.20 p. m., shock lasting ten seconds. 9th, at 8.30 p. m., several shocks, lasting five minutes, on the coasts of Peru, Bolivia, and Chili. 10th, earthquake-waves on the Sandwich Islands and the California coast. According to the Simultaneous International Reports received at this office from Costa Rica, a feeble earthquake shock was experienced at San José, at 5h. 28m. a. m., local time of the 10th (or 6h. 24m. Iquique time), and therefore 9h. 54m. after the occurrence of the shock at the place of its origin. 15th, Port Stanley, Ontario, in the morning, a wave five feet high, probably due to some earthquake shock, suddenly swept along the northern shore of Lake Erie, followed for an hour by smaller ones. 25th, earthquake shock Knoxville, Tenn. 26th, 3 p. m., earthquake shock New Harmony, Ind.

Concerning the earthquake of the evening of the 9th on the southern coast of Peru, and the accompanying destructive wave which spread over a great part of the Pacific Ocean, the reports that have been received are, in brief, to the following effect: About 8.30 p. m., several very heavy, destructive earthquake shocks occurred within four or five minutes throughout the region from Arica (latitude 18.4° south) to Mexillones, at the southern extremity of Bolivia, and apparently proceeding from a central region near the boundary between Peru and Bolivia, or near the volcano Llago (Laguna? or Argua?). The shocks were felt with less severity at Antofagasta (possibly the town of that name in the Argentine Confederacy, latitude 26½° south, longitude 67½°), and also throughout Chili and Northern Peru. The shock was immediately followed by a great ocean-wave, which began by a recession of the sea from the shore; this recession seems to have been going on during the continuance of the shocks. Within a few minutes after the last severe shock, and in some cases while fire-engines were being placed placed near the sea-shore to obtain water for extinguishing the fires, the great wave suddenly dashed up over the shore, destroying everything within its reach. Among the detailed reports that have been received are the following: Beginning at the central region at the mouth of the river Loa (latitude 21.5° south, longitude 22.5° west) we have, first, Cobija (latitude 22.5° south), three-fourths of the town destroyed; wave thirty-five feet high. Tocopilla, town obliterated. Mexillones (latitude 23.1° south), town two-thirds obliterated; wave sixty-five feet high. Coquimbo (latitude 29.9° south), light shocks. Going northward we have, first, Pebillon de Pica, or Chavanago, (latitude 21.2° south), town obliterated by the shock, fire, and the water; many vessels njured in the harbor; the sea continued greatly agitated all night. Huanillos, town ob-

literated; wave nearly sixty feet high. Iquique (latitude 20.2° south), shocks about 8.30 p. m., exact interval from first to last four minutes and twenty seconds, all proceeding from the southeast, and with great regularity; the whole town shaken down, burned with fire, or washed away; the recession of the sea occurred, and the first great wave came in several minutes, possibly ten minutes, after the first shock. Arica (latitude 18.4° south), very numerous shocks, destroying all the fine buildings, followed by a recession of the sea, and then eight successive waves, from ten to fifteen feet in height. Ilo (latitude 1.6° south), partly destroyed by ocean-wave. Callao (latitude 12° south, longitude 77.1° west), the first ocean-wave felt at 11 p. m.; several distinct rises and falls were felt during the night; the highest rise, about eight feet, occurred at 4 a. m., 10th. Anaheim, Cal. (latitude 33.8° north), ocean-wave rose twelve feet in a few minutes. Gaviota, Cal. (latitude 34.4° north, longitude 120.1°), water rose and fell twelve feet three times in succession, between 7.10 a. m. and 7.30 a. m. San Francisco (37.5° north, longitude 122.5°), first earthquake-wave began 6.18; maximum wave of fourteen inches rise and fall at 8.20 a. m., with maxima one hour apart; five rises and falls of nine inches occurred in eight minutes, superposed upon the larger wave. Sandwich Islands: throughout these islands the waves were large and sometimes destructive. The time of the first wave is well fixed for Honolulu as 4.45 a. m., at which time the tide ran out and returned in twelve minutes; in this time the observers at Oahu and Maui agree. At Hilo, farther southeastward, the observer says the ebb began at 4 a. m., and the wave swept in at 5 a. m., and others kept coming in all day; at 7 a. m. a wave was timed and found to occupy four minutes in going through an extreme rise and fall of fourteen feet; in the afternoon three successive waves were timed and the average gave for each twenty minutes in passing through its rise and fall of ten and a half feet. The heights of the waves at the different islands are as follows: On Hawaii, five feet at Kaiwaihie; thirty feet at Kealakekua; thirty-six feet at Hilo. On Maui, six to twelve feet at Makee and Mamalua; twelve feet at Lahaina; twenty two feet at Kahului. On Oahu, four feet ten inches at Honolulu. On Kauai, three feet at Naivailiwila. The volcano of Kilauea had exhibited unusual activity during the previous two weeks.

The following table gives the means of estimating approximately the velocity of the earthquake sea-wave in its passage over the Pacific Ocean:

Station.	Longitude, west.	Difference in time.	Arrival of wave.		Interval.	Great circle distance.	Average velocity, hourly.
			Local time.	Normal time.			
	°	*h.*	*h. m.*	*h.*	*h.*	°	°
Oregon	70.3	0.0		8 30 p. m.	8.5	0.0	0.0	.....
Callao	77.1	0.5	First, 11 0 p. m.	11.5	3.0	11.5	3.8
			Max., 4 10 a. m.	16.5	8.0		1.4
Gaviota	120.1	3.3	7h. 10m. to 30 a. m.	22.6	14.1	73.8	5.2
San Francisco	122.5	3.5	First, 6 18 a. m.	21.8	13.3	76.0	5.8
			Max., 8 20	24.1	15.6		4.9
Honolulu	157.9	5.8	First, 4 45 a. m.	22.6	14.1	96.0	6.8

NOTES AND EXTRACTS.

Mr. S. W. Holman, of Boston, communicates to the Philosophical Magazine the results, as regards the air, of a new method of studying the relation between the viscosity and temperature of gases. As a result of his first experiments, he says it would appear that the viscosity of air increases proportionally to the 0.77 power nearly of the absolute temperature expressed in centigrade degrees between the temperatures 32° and 212° Fahrenheit.

Mr. F. Guthrie describes a mercurial barometer of great sensitiveness, concerning which he states that the models he has made appear to succeed well. It consists of an ordinary vertical barometer-tube, connected by a flat, horizontal, spiral tube of much smaller diameter, with a second short, open tube, corresponding to the short leg of a syphon-barometer. A small bubble of air is visible in the spiral tube, dividing the mercury into two portions; the movement of this bubble is more rapid than the movement of the top of the mercurial column in the proportion of the area of the vertical and spiral tubes.

Observations on the relation between the weather and the twinkling of stars have been made for a number of years by Montigny, in Belgium, and, as the result of observations on two hundred and thirty evenings, with his scintillometer, he finds that the scintillations increase on the approach of a storm, especially of rain.

The direct use of the heat of the sun, instead of its indirect use, as a motive power, continues to attract much attention in France, and it is computed that in Southern

Europe, and still more so in tropical countries, it can advantageously replace windmills and water-mills, and possibly steam-engines in special cases.

With reference to the distribution of rain, Ponsset, of Poitiers, France, states that in his department, he finds that the rain-fall is least in the most wooded districts, contrary to the generally received opinion.

With reference to the beneficial sanitary influence of eucalyptus globulus the reports from Algeria and Corsica unite in saying that, wherever the tree has been extensively cultivated, intermittent fever has been considerably decreased in intensity and in frequency.

Professor Vignier states as the result of his studies that the only requisites for the formation of hail-storms are, first, the existence of strata of air of different temperatures; second, the lateral translation of these strata; and, third, the presence of mountains. He excludes all reference to small cyclones and electric phenomena, and regards only the mechanical movements of the atmosphere and the effects of the inequality of the soil.

With reference to the measurement of rain-fall by means of gauges on board of ships, Lieut. Henry Horkins, R. N., states that he has compared two forms of marine rain-gauges, manufactured respectively by Casella and Negretti and Zambra, in both of which the receiving-mouth of the gauge was kept nearly horizontal by supporting the apparatus on gimbals. He finds Casella's gauge slightly more trustworthy, although the differences between the two are but slight, except in windy weather. He recommends that two gauges be always employed, one on each quarter of the ship, and that the mean between their indications be the accepted result.

From a series of observations on the accuracy of wet-bulb thermometers under different conditions, Messrs. Marriott and Ward deduce the following conclusions as a contribution to hygrometry:

First. The accuracy of the apparatus depends most upon the kind of muslin and the conducting thread leading to the water reservoir; those thermometers having thick muslin read too high and are less sensitive; in calms all wet bulbs read alike, but when a breeze springs up thin muslins will drop down a degree in a few seconds, while thick muslins and lamp-wicks require one or two minutes.

Second. The dry and wet bulbs should be of the same make and size—cylindrical bulbs are much preferable to spherical ones; it would be a great advantage if the muslin wrapping could be replaced in any way by a roughening or frosting of the glass bulb.

Third. The open water-reservoir should not stand near either bulb, otherwise they would be seriously affected, and the water cup should be covered over, having only a small orifice for the conducting thread; the wet-bulb covering should be of very fine muslin or linen, and changed once a month or oftener, and during very cold weather the muslin covering should be dispensed with, provided a proper coating of ice can be obtained on the naked bulb.

Fourth. When the muslin covering is to be changed the bulb should be cleaned by washing in dilute sulphuric acid.

In some remarks on the above communication, Mr. Whipple, of the Kew Observatory, called attention to a series of unpublished observations made at Kew in 1869, which showed that observations made with a delicate Regnault hygrometer gave dew-points agreeing very closely with those deduced from the readings of the dry and wet thermometers by means of Mr. Welsh's sliding rule, constructed on Apjohn's formula.

Mr. Marriott added that he had made observations with Dines's and Regnault's hygrometers, and that they agreed together very well; he thought that the simplicity of Dines's hygrometer was decidedly in its favor.

A very sensitive thermometer, invented and used for many years by Moritz, has been recently described by him. It consists essentially of a cylindrical band compounded of two strips of platinum and silver soldered together. One end of the band being fastened the other end is free to move with every change of temperature, and, in doing so, moves a mirror mounted upon an axis in such a way as to reflect to the observer's eye the divisions upon a fixed scale, as in magnetic observatories. The instrument, as used by Moritz, may be contained in a box of less than two inches on a side; it can be exposed to the weather if need be, and can, also, be used as a wet-bulb thermometer; it appears to be accurate to the fiftieth part of a degree, Fahrenheit.

The somewhat rare phenomenon of a fall of golden yellow snow occurred in the midst of a severe storm on the afternoon of the 27th of February, at Peckeloh, in Germany. A specimen of the water melted from this snow, after being kept a few days, was microscopically examined by Weber, who describes it in Klein's Wochenschrift; he found that it contained principally four different kinds of germs or organisms, shaped respectively like arrows, coffee-beans, horns, and dark flat disks.

A monthly comparison of the weather in Central Europe and Northern America is published in the Annalen of the Hydrographic Bureau of Germany, from which it appears:

First. That in January, 1877, the barometric variations were very large in America in the first half of the month, but were large in Europe in the second.

Second. The large number of low-pressure areas and attending storms over both continents.

Third. The prolonged low temperatures of North America and the extraordinary high temperatures of Europe.

Fourth. The deficiency of rain-fall in America and its notable excess in Europe.

A remarkable fall of hail occurred in France on the 4th of April, 1877, and, according to the description in La Nature, these were uniformly of a conical shape, having round or hemispherical bases; they averaged over an inch in length and three-quarters of an inch in diameter. The sides of the cone were distinctly marked and the interior exhibited the usual concentric arrangements of its parts.

In a report of the commission of the Paris Academy of Sciences, the result of recent labors on the subject of the heat received from the sun is thus summarized: 1st, M. Crova, by means of observations with the pyrhliometer of Pouillet, and the actinometer of Viola, has shown that the law of the intensity of solar heat as a function of the thickness of the atmosphere is represented by the hyperbolic formula $y^{m}(c + m x) =$ constant where x is the thickness of the atmosphere traversed by the rays, y is the heat received by the observer, and c and m are constants. As to the quantity of the heat received normally at the upper limits of the atmosphere, he shows that it can scarcely differ from 2 calories per minute per square centimeter. Finally, Crova also shows that about one-twentieth more heat was received at Montpellier in 1875 than at Paris in 1874. 2nd. Viola has sought to determine the numerical value of the solar radiation, and to deduce therefrom the temperature of the sun; he, in order to determine the amount of heat absorbed by the earth's atmosphere, has made simultaneous observations with actinometers at different altitudes.

Published by order of the Secretary of War.

ALBERT J. MYER,
Brig. Gen. (Brevet Assigned), Chief Signal-Officer, U. S. A.

PAPER 37.

MONTHLY WEATHER REVIEW, JUNE, 1877.

INTRODUCTION.

The present review for the month of June depends upon all data received up to the 14th of July from the Canadian Meteorological Service, the United States Signal Service and voluntary observers, the Army Post Surgeons, and the United States Navy. The most interesting features have been: First, the high temperatures in California; second, the heavy rains in the Mississippi and Missouri Valleys; third, the numerous severe local storms; and fourth, the general diminution of grasshoppers and locusts.

BAROMETRIC PRESSURE.

In general.—The general distribution of barometric pressure for the month is shown by the isobars on Chart No. II, from which it will be seen that the highest pressure has been off the South Atlantic coast, whence it diminished very regularly northwestward toward Dakota, in the northern part of which Territory it is probable that the lowest monthly average will be found. The isobar of 29.80, as shown on this chart, agrees very closely in its position with those that obtained in the previous years, 1872 to 1876, inclusive. The pressure has been slightly lower at San Diego, Cal., and lower at Portland, Oreg., than in previous years.

Barometric range.—The general range of the barometer over the whole country east of the Rocky Mountains was about 1.15 inches, as may be seen from the following table, which gives the maximum and minimum pressures that occur on the tri-daily maps near the centers of the respective areas of high and low barometer:

LOW AREAS.

No.	Location.	Date.	Minimum pressure.
I	Manitoba	June 1, 7.35 a. m	29.35
II	Ohio Valley	June 5, 4.35 p. m	29.50
III	Lower Missouri Valley	June 6, 11 p. m	29.23
IV	Lake Erie	June 9, 4.35 p. m	29.42
V	Lake Michigan	June 11, 7.35 a. m	29.74
VI	Missouri Valley	June 14, 4.35 p. m	29.60
VII	Manitoba	June 17, 4.35 p. m	29.45
VIII	Cape Breton	June 22, 4.35 p. m	29.27
IX	Manitoba	June 23, 4.35 p. m	29.35
X	Kansas	June 25, 4.35 p. m	29.50
XI	Lake Superior	June 30, 11 p. m	29.29

HIGH AREAS.

No.	Location.	Date.	Maximum pressure.
I	South Atlantic coast	June 2, 7.35 a. m.	30.27
II	Cape Breton	June 8, 7.35 a. m.	30.38
III	Shreveport, La	June 10, 7.35 a. m.	30.23
IV	Cape Breton	June 12, 7.35 a. m.	30.33
V	Manitoba	June 19, 7.35 a. m.	30.27
	Lake Superior	June 19, 4.35 p. m.	
VI	East Gulf coast	June 20, 7.35 a. m.	30.18
VII	Upper Michigan	June 22, 7.35 a. m.	30.29
	Middle Atlantic States	June 23, 7.35 a. m.	30.31
VIII	Cape Breton	June 30, 7.35 a. m.	30.21

The greatest local barometric ranges have been as follows: 0.91 at Bismarck and Escanaba; 0.92 at Breckenridge; 1.10 at Duluth; 1.02 at Marquette; 0.94 at North Platte.

The least local barometric ranges have been, 0.45 at Indianola, Shreveport, and Montgomery; 0.43 at Vicksburg; 0.44 at Saint Louis, and Cairo; 0.38 at Saint Mark's; 0.36 at New Orleans and Mobile; 0.40 at Galveston and Jacksonville; 0.41 at Memphis.

Areas of high pressure in general.—The areas of high pressure have, as usual during the summer, consisted principally of the occasional encroachments upon the Gulf and Atlantic States of the general area of high pressure prevailing over the Atlantic. The high-pressure areas, due to the flow of cold, dry air southeastward from the Rocky Mountain region and British America, have been but very feebly marked; only two such areas, Nos. V and VII, are included in the following list:

No. I was central over the South Atlantic States during the 1st, and over the East Gulf States during the 2d, 3d, and 4th, and over the eastern portion of the Gulf of Mexico on the 5th, by which time the pressure had diminished to 29.90, or less, but rose again on the 7th to 30.05, or more, and so continued over Florida and the South Atlantic coast until the 9th.

No. II. Pressure rose on the 6th over Nova Scotia, with easterly winds, and continued rising during the 7th and 8th, but fell to 30.00 on the morning of the 10th.

No. III. Pressure rose on the 9th in Texas, with northwest winds, which winds at that time prevailed over the Ohio region, northward to Manitoba. The area of highest barometer continued in Texas during the 10th, and extended slowly eastward to the Mississippi Valley, where it remained during the 11th and 12th, after which it diminished slowly, with southerly winds.

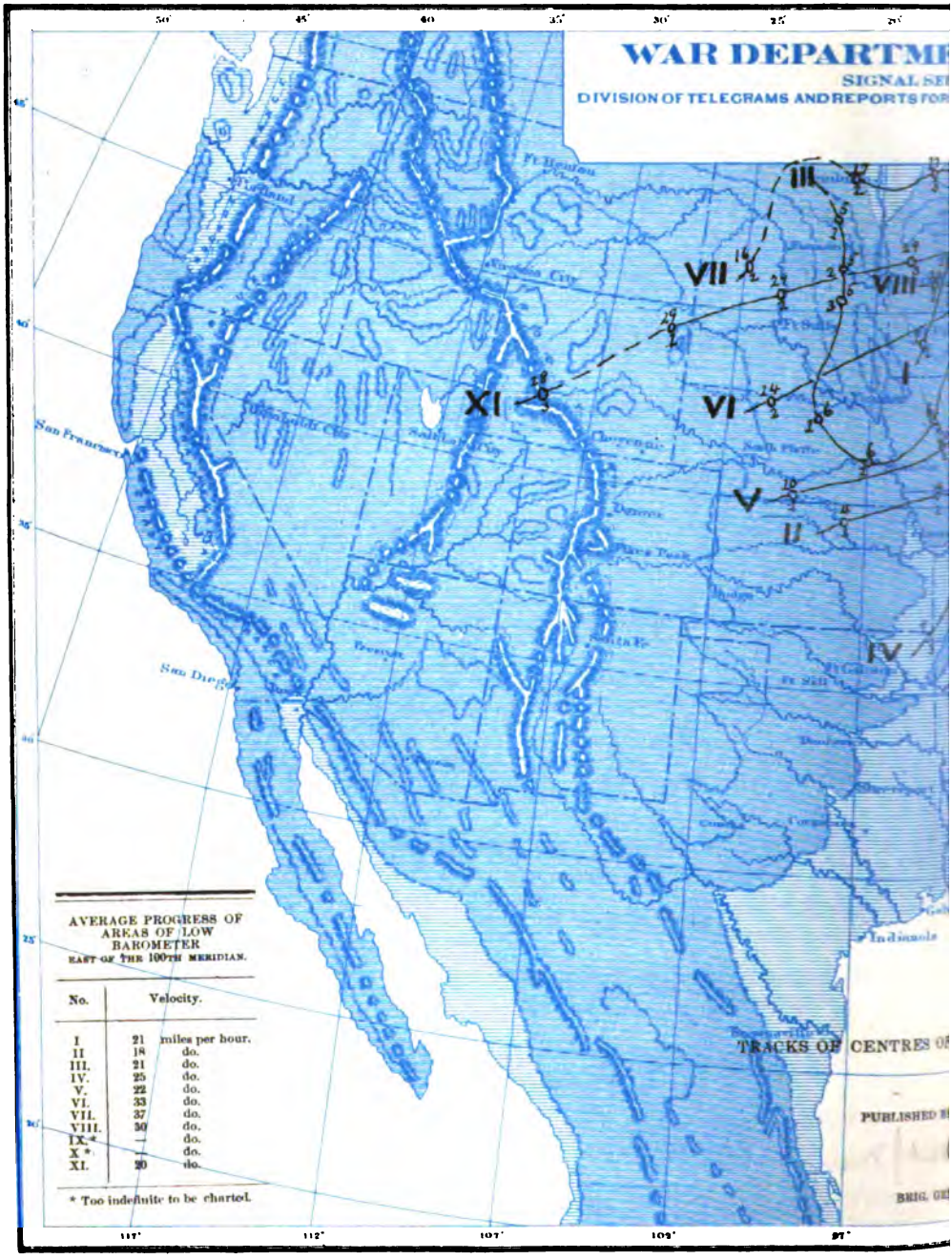
No. IV. Pressure increased during the 11th on the entire Atlantic coast, and especially with easterly winds in the Middle Atlantic States. North and east winds prevailed on the 12th at most of the coast stations, the isobars continued trending parallel to the Appalachian range, and pressure at 11 p. m., of the 12th, ranged between 30.20 in South Carolina and 30.30 at Cape Breton. The barometer fell during the 13th, but remained highest near Cape Hatteras during the 14th and 15th, after which it remained highest off the South Atlantic coast and over Florida until the 17th and 18th.

No. V. In the rear of low barometer No. VII, pressure rose rapidly in Manitoba, where it was 29.74 at 7.35 a. m. of the 18th, but 30.27 at 7.35 a. m. of the 19th. This area of high pressure moved rapidly southeastward, and was central in the Saint Lawrence Valley at 7.35 a. m. of the 20th, and off the Middle Atlantic coast at 4.35 p. m.; it was immediately followed by low barometer No. VIII.

No. VI and VII. Pressure was high at stations on the Gulf coast from 19th to 31st. On the 21st, immediately in the rear of low No. VIII, it rose rapidly over the Upper Lake region; on the 22nd, at 7.35 a. m., it was highest over Lake Superior; on the 23d, 7.35 a. m., over Pennsylvania; on the 24th, 7.35 a. m., off Cape Hatteras. The pressure was high over the Southern States on the 25th, and over the eastern portion of the Gulf States, on the 26th, 7.35 a. m.; over the Lower Missouri Valley on 27th, 7.35 a. m., after which it diminished.

No. VIII.—Pressure rose on Middle and East Atlantic coast on the 28th, while, in the interior of the country, low barometer No. XI was developing; easterly winds prevailed at most of the Atlantic coast stations, and the highest pressure, which was at first central off the Middle and East Atlantic coast, was by 7.35 a. m., 30th, transferred to the South Atlantic coast, while the isobars continued trending parallel to the mountain ranges.

Areas of low pressure in general.—Eleven areas of low pressure are enumerated in the following list, of which nine were sufficiently definite to justify the charting of their tracks, as given on map No. I. In general, their paths lay considerably to the


WAR DEPARTME
SIGNAL SE
DIVISION OF TELEGRAMS AND REPORTS FOR
III
VII
VIII
XI
VI
V
I
II
IV
San Francisco
San Diego
Indianola
TRACKS OF CENTRES OF
PUBLISHED
BRIG. GE
AVERAGE PROGRESS OF AREAS OF LOW BAROMETER EAST OF THE 100TH MERIDIAN.
No. | Velocity.
I 21 miles per hour.
II 18 do.
III. 21 do.
IV. 25 do.
V. 22 do.
VI. 33 do.
VII. 37 do.
VIII. 30 do.
IX.* — do.
X.* — do.
XI. 20 do.
* Too indefinite to be charted.

No. I.



REAS OF LOW BAROMETER FOR JUNE, 1877.

RDER OF THE SECRETARY OF WAR.

BVT. ASSC'D) CHIEF SIGNAL OFFICER, U. S. A.

north of those charted in June, 1875 and 1876, and agree better with those charted in June 1873 and 1874. The areas of low pressure that have passed from the Rocky Mountains eastward, during the month of June, appear, in all cases, to have originated on the eastern slope. The principal depression that occurred on the Pacific slope was 29.75 inches on the 12th at San Francisco, which was accompanied by, and may have been due to, an extensive depression in Nevada, Colorado, Dakota, and other portions of the Rocky Mountain region.

No. I.—This depression appears on the morning of the 1st central in Minnesota, and appears as a trough stretching north and south, lying between areas of cold northwest winds on the west and warm southerly winds on the east. It moved to the northnortheast until beyond our stations, and then passed, during the 2d and 3d, eastward over Canada; it disappeared on the 4th over the Gulf of Saint Lawrence. During these three days the prevailing low pressure in Canada and high pressure in the Southern States gave rise to steady south and west winds and numerous areas of local rains over the Lake region, the Middle and Eastern States.

No. II.—During the 3d increasing southeast winds prevailed from Texas to Missouri, culminating during the night in local rain-storms in Indian Territory. On the morning of the 4th, the pressure was lowest in the Missouri Valley, whither the winds tended during the rest of the day. The 4.35 p. m. map of the 4th shows rain-fall at nearly all stations between Minnesota and Indian Territory. Concerning the severer local storms occurring on that day at Mount Carmel, Mattoon, Boonville, &c., see the appropriate chapter. The fall of the barometer appears to have been most decided on the eastern side of the low area, which accordingly moved due eastward between the regions of cold northerly and warm southerly winds that lay north and south of its track. Its center was on the morning of the 5th in Eastern Illinois, and on the morning of the 6th in West Virginia, whence it stretched very slowly eastward until it disappeared, on the morning of the 7th, off the coast of New Jersey.

No. III.—This depression originated on the morning of the 5th in Dakota and Manitoba on the western edge of the extensive area of cool air that passed southeastward in the rear of low barometer No. II. During the afternoon of the 5th, the barometric depression extended rapidly southward into Kansas, its center remaining apparently in Dakota or possibly still further to the northward, but on the morning of the 6th it is judged to have been located in Nebraska, because in that region the opposing northwest and southeast winds were then prevailing. The southern end of the trough was, as is usual, rapidly closed up by the cold, northwest winds, which attained a velocity of 56 miles per hour at Dodge City, Kans., at 4.35 p. m. of the 6th, and at 11 p. m. a very considerable and well-marked depression was central in Iowa, with brisk and high northwest winds in the Missouri Valley. The depression now passed northeastward to Lake Superior, where it was central at 11 p. m. of the 7th, after which it disappeared. The heaviest rain-falls attending the progress of this low area were in the immediate Missouri Valley, and occurred during the prevalence of cold northwest winds, or just preceding the shifting of the winds to that quarter, and generally in rear of the principal area of low pressure.

No. IV.—Between the 6th, 11 p. m., and the 7th, 11 p. m., the temperature fell 9° at Cheyenne, 15° at Denver, 9° at Santa Fé, 7° at Leavenworth, 6° at Shreveport, and similarly over the entire intermediate region, near the center of which the opposing northwest and southeast winds continued to meet during the entire twenty-four hours. In this region originated storm No. IV, whose center is placed in the northeastern corner of Indian Territory, at 11 p. m. of the 7th, at which time, therefore, it appears as the southernmost of a series of depressions, of which No. III is also one. On the 8th, at 4.35 p. m., No. IV was central in Northern Illinois; at 11 p. m. in Southwestern Michigan, and on the 9th, at 7.35 a. m., over Lake Huron. Heavy rains had accompanied its progress throughout the Gulf States, the Ohio Valley, Missouri, and Illinois. At Memphis, nine inches had fallen up to 4.35 p. m. of the 8th, and four and a half inches more fell on the 9th before 7.35 a. m. Under these circumstances, a decided fall of the barometer took place over Tennessee and Kentucky, and there is reason to assume that a small secondary depression moved northeastward nearly parallel with the principal one, and was, during the night of the 9th, united therewith in the northern portion of Canada. During the afternoon and evening of the 9th, these depressions being then in the Lower Lake region, there were experienced on Lakes Erie and Ontario heavy southwest winds, with rain. On the 10th, this depression moved northeastward down the Saint Lawrence Valley, and disappeared over the Gulf.

No. V.—During the morning of the 10th, the pressure rose at most stations east of the Rocky Mountains; but by 4.35 p. m. a slight depression had become manifest in Illinois and Eastern Iowa, extending thence southwestward to Northern Texas. This slight depression moved slowly northeastward and disappeared by midnight of the 11th over Lake Superior. It was not marked by the prevalence of any extensive area of high winds or of heavy rains.

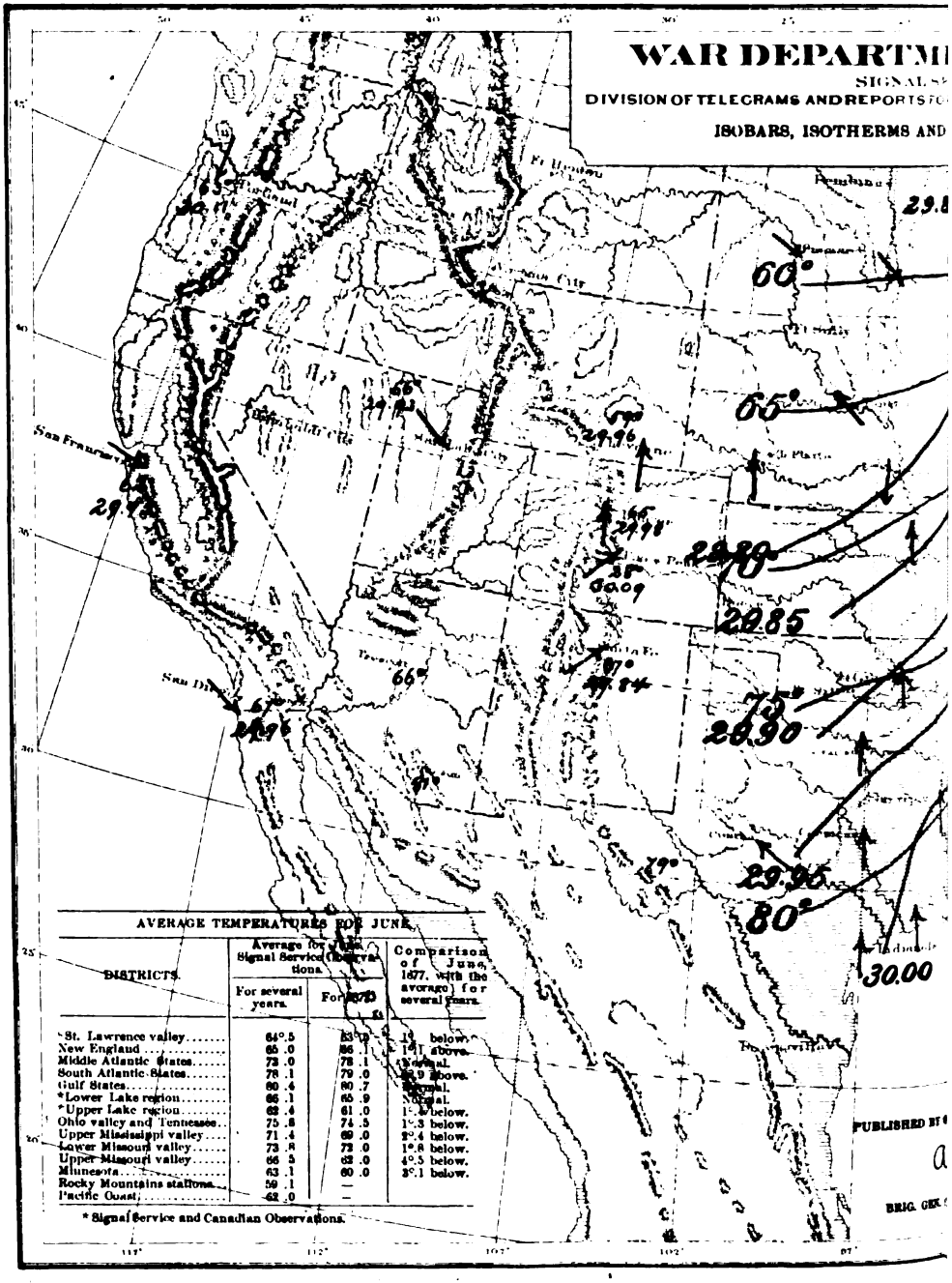
No. VI.—The pressure continued low from the Upper Lake region westward to the Rocky Mountains during the 12th and 13th, and was also quite low in California. It

fell slowly in Texas and at most of the Rocky Mountain stations. It was high, but falling, during the 12th in Oregon; where, on the 13th, at 4.35 p. m., it was 29.96, after which it rose somewhat. It appears, therefore, that a very general depression existed during these days over a greater part of the region lying between the Missouri, the Mississippi, and the Pacific, and that it originated in this region seems the most plausible assumption. On the 14th, at 4.35 p. m., we have the first reports of northerly winds in Dakota and Wyoming, and may place the center of greatest barometric depression in Northern Nebraska. A rapid rise in pressure now occurred to the northward, with colder northerly winds, and the depression stretched, as usual, northeast and southwestward into a trough which, on the 15th, at 4.35 p. m., extended from Missouri northeastward over Lake Huron and beyond; its center is at this time placed at Mackinac. At 11 p. m., this trough evidently extended from Missouri to the mouth of the Saint Lawrence, being, as usual, the boundary between the areas of northerly and southerly winds. During the 16th this depression broke up into several ill-defined areas, of which the principal one was over the Gulf of Saint Lawrence, where the pressure continued low during the 17th.

No. VII.—This depression appears first on the afternoon of the 16th in Western Dakota, and was, apparently, at that time the southern end of a trough trending still further northwestward. At 4.35 p. m., the temperature had risen remarkably in Indian Territory, Kansas, Nebraska, Colorado, and Utah. At 11 p. m., high temperatures prevailed in Minnesota, Iowa, and Nebraska, and the winds were uniformly directed toward Western Dakota. On the 17th, at 7.35 a. m., high temperatures prevailed from Kansas northward to Manitoba. The pressure had very generally fallen; southeast rather than southerly winds prevailed, and several local rain or hail storms were reported. The southern end of the barometric trough, that was evidently still forming, was probably at this time in Manitoba, but at 4.35 p. m., the 17th, it can be located, with certainty, in Northeastern Dakota; it was, at 11 p. m., in Northern Minnesota; on the 18th, at 7.35 a. m., the trough stretched from Eastern Nebraska to Lake Superior, but at 4.35 p. m. the pressure had rapidly filled up on its western sides, where an area of high barometer then appeared, and the low pressure, like its predecessor, stretched as a series of slight depressions from Kansas to Lake Huron. At 11 p. m. of the 18th, the isobar of 29.90 extended from Indian Territory to the Gulf of Saint Lawrence, very much as was the case at 11 p. m. of the 15th, and the only low pressures were in Northern Canada, beyond the limit of our stations, where, however, they apparently continued to progress eastward, giving rise to the low pressure that prevailed over Newfoundland on the 19th.

No. VIII.—The barometer was low on the 19th over California, Oregon, and Rocky Mountain stations, while high pressure No. VII was over the Lake region. Low pressure No. VIII appears to have been central in Western Dakota at 11 p. m. on the night of the 19th; commenced to move slowly to the east-northeast on the 20th, and, at 11 p. m., was central north of Lake Huron. The northerly winds that followed it were accompanied by extensive heavy rains, which, on the same date, prevailed over Lower Michigan, Wisconsin, Illinois, Iowa, and the Lower Missouri Valley. This region of heavy rains lay in the rear of and on the southwest side of the region of lowest pressure, but on the northern limit of the region of fresh southerly winds. The succeeding weather-map, June 21, 7.35 a. m., shows that this area of rains had moved eastward to the Lower Lake region, while the area of low pressure had extended rapidly southward, and during the rest of the day covered the Middle and East Atlantic States. The 7.35 a. m. report of the 22d shows that heavy rains had fallen over the Middle Atlantic States wherever the cooler northwest winds had replaced the warm southerly winds of the preceding morning, and, therefore, under circumstances precisely similar to those that accompanied the heavy rain of 11 p. m. of the 20th in Iowa, Wisconsin, &c. After 11 p. m. of the 21st, the pressure fell rapidly over Maine and the Canadian Provinces, and the area of lowest pressure disappeared over the Gulf of Saint Lawrence on the 22d.

Nos. IX and X.—This extensive but indefinite area of low pressure No. IX was developed on the 22d over the Rocky Mountain region, and on the 23d, extended southward from Manitoba into the Missouri Valley. During the 23d, 24th, and 25th, the central lowest pressure probably moved eastward through Northern Canada, while there was visible within the region covered by our western stations only the southern extremity of the extensive trough of low pressure; near the southern extremity of this trough there originated, on the 24th, a series of severe local storms, which are fully described under that heading. During the 26th, the area of falling barometer extended eastward into the Middle States, and the numerous local rains and storms that prevailed over the Ohio Valley, the Northwest, and Lake region were followed by a decided rise in pressure and cooler northwest winds. At 11 p. m. on the 26th the lowest pressure was over Pennsylvania, and at 7.35 a. m. on the 27th it was off the Middle Atlantic coast. At this time pressure was nearly uniformly lowest, although not very low, from the Middle Atlantic coast westward to Kansas, and during the rest of the day a slight depression developed over the Middle Atlantic States, while the pressure rose both northeast

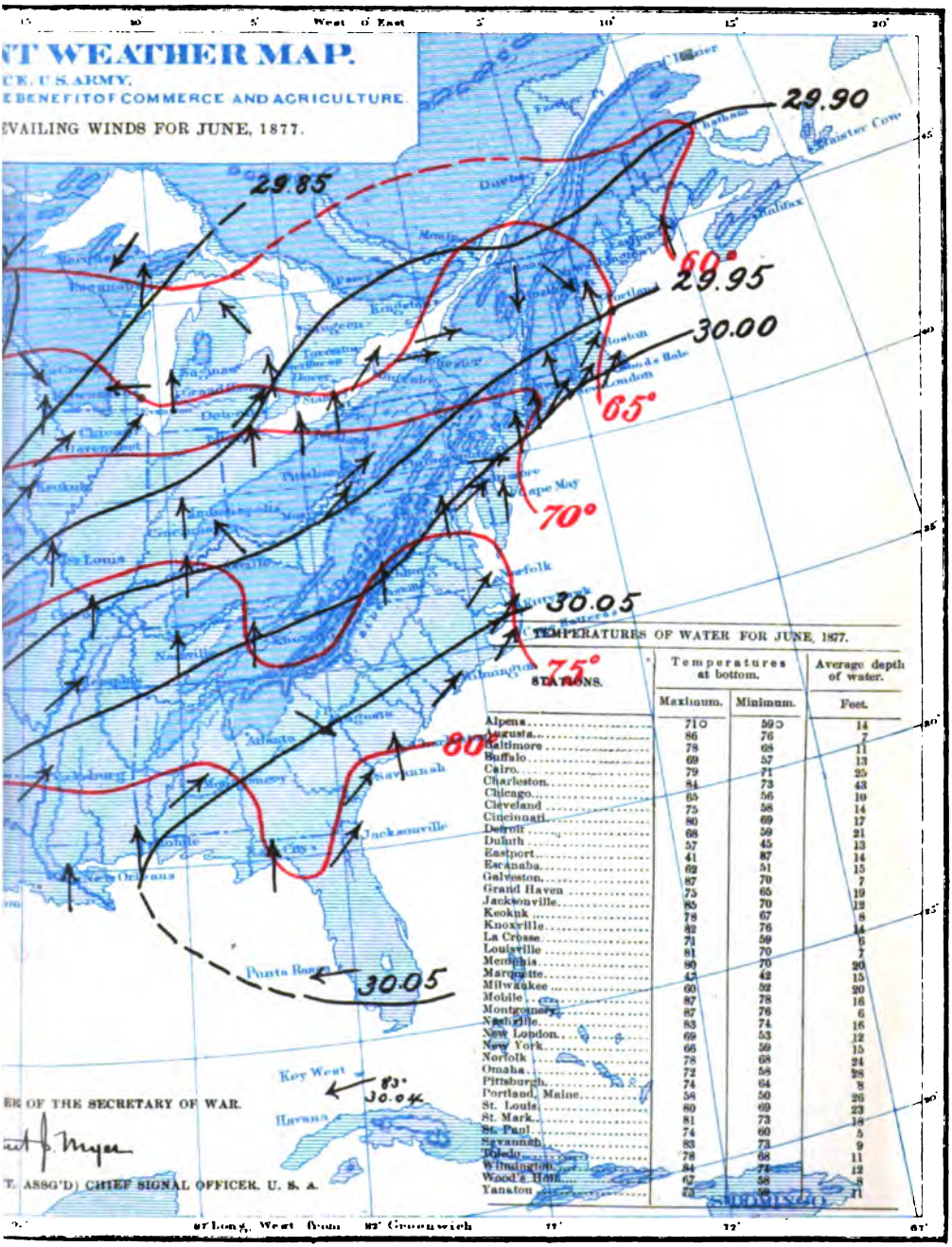


AVERAGE TEMPERATURES FOR JUNE.

DISTRICTS.	Average for years Signal Service Observations.		Comparison of June, 1877, with the average for several years.
	For several years.	For 1877.	
*St. Lawrence valley	64°.5	53°.0	11° below.
New England	66 .0	66 .1	1°.1 above.
Middle Atlantic States	73 .0	73 .1	Normal.
South Atlantic States	78 .1	79 .0	0°.9 above.
Gulf States	80 .4	80 .7	Normal.
*Lower Lake region	66 .1	65 .9	Normal.
*Upper Lake region	62 .4	61 .0	1°.4 below.
Ohio valley and Tennessee	75 .8	74 .5	1°.3 below.
Upper Mississippi valley	71 .4	69 .0	2°.4 below.
Lower Missouri valley	73 .8	72 .0	1°.8 below.
Upper Missouri valley	66 .5	62 .0	4°.5 below.
Minnesota	63 .1	60 .0	3°.1 below.
Rocky Mountains stations	59 .1	—	—
Pacific Coast	62 .0	—	—

* Signal Service and Canadian Observations.

No. 11.



TEMPERATURES OF WATER FOR JUNE, 1877.

STATIONS.	Temperatures at bottom.		Average depth of water.
	Maximum.	Minimum.	Feet.
Alpena	71	59	14
Augusta	86	76	7
Baltimore	78	68	11
Buffalo	69	57	13
Cairo	79	71	25
Charleston	84	73	43
Chicago	65	56	10
Cleveland	75	58	14
Cincinnati	80	69	17
Detroit	68	59	21
Duluth	57	45	13
Eastport	41	37	14
Escanaba	69	51	15
Galveston	87	70	7
Grand Haven	75	65	19
Jacksonville	85	70	12
Keokuk	78	67	8
Knoxville	82	76	14
La Crosse	71	59	6
Louisville	81	70	7
Memphis	80	70	20
Marquette	47	42	15
Milwaukee	60	52	20
Mobile	87	78	16
Montgomery	87	76	6
Nashville	83	74	16
New London	69	53	12
New York	66	59	15
Norfolk	78	68	24
Omaha	72	58	28
Pittsburgh	74	64	8
Portland, Maine	58	50	26
St. Louis	80	69	23
St. Mark	81	73	18
St. Paul	74	60	5
Savannah	83	73	9
Toledo	78	68	11
Wilmington	84	73	12
Wood's Holl	67	58	8
Yanaton	70	59	11

and northwestward. On the 28th, at 4.35 and 11 p. m., a slight depression existed off the South Atlantic coast, which is numbered X in our list. The tracks of Nos. IX and X are too indefinite to admit of being charted.

No. XI.—The pressure was low in Oregon at 4.35 and 11 p. m. of the 27th, which depression was apparently but a part of that which then prevailed over most of the Rocky Mountain stations. The central lowest pressure was probably at 11 p. m. either in Wyoming or Montana, whence it moved eastward over Dakota and Minnesota and Lake Superior, as a well-marked area, preceded by very warm southerly winds, and followed by high northwest winds. At 11 p. m. of the 30th, it was probably central over the northeastern portion of Lake Superior. The further history of this storm-center belongs to July, as it disappeared on the 3d over the Gulf of Saint Lawrence.

Vessels experiencing storms at sea.—1st, north 49° 29′, west 6° 0′, strong west-southwest gale and heavy swell. 2d, north 48° 47′, west 28° 7′, strong northwest gale and high sea; north 49° 27′, west 9° 12′, strong southwest gale and heavy rain. 9th, north 43° 37′, west 47° 12′, strong north and north-northwest gale. 12th, east coast of Mexico, severe norther.

TEMPERATURE OF THE AIR.

In general.—The general distribution of temperature for the month is shown by the isotherms on Chart No. II. A comparison with the averages for June during the past seven years shows that the temperatures have been slightly above the average in New England and the South Atlantic States, but slightly below in the Saint Lawrence Valley, Upper Lake region, Ohio Valley and Tennessee, and the Lower Missouri Valley, and decidedly below in the Upper Mississippi and Missouri Valleys and in Minnesota.

Monthly mean temperatures, at special points, have been as follows: Mount Washington, 44°.8; Pike's Peak, 28°.1; Virginia City, 52°.8.

Maximum and minimum temperatures.—Maximum temperatures above 95° were reported as follows: 96°, Corsicana, Nashville, Shreveport, Washington; 97°, Denison, Augusta, Tybee Island, Wilmington; 98°, Saint Mark's; 99°, Jacksonville, Norfolk, Savannah; 100°, Mobile, Charleston, Montgomery; 101°, San Antonio; 108°, Rio Grande. Minimum temperatures below 35°: 34°, Bismarck, North Platte; 33°, Santa Fé; 32°, Cheyenne; 30°, Breckenridge; 25°, Mount Washington; 10°, Pike's Peak. The interval from Friday, June 8th, to Tuesday, June 12th, was marked by excessively high temperatures in Southern California; said to have been the highest, in fact, that have been reported since the memorable summer of 1859, when the maximum temperatures for June were, Fort Yuma, 117°; San Diego, 102°; and later in the summer of the same year there were reported, at San Bernardino, 133°, the old placer belt, 117° to 119°. During the present June the maxima have been: Yuma, Ariz., 114°; Stanwix, 110°; Maricopa Wells, 110°; Wickenburg, 108°; Camp Verde, 104°; Campo, Tucson, 102°; Phœnix and Florence, 100°, on the 12th; San Francisco, 92°, 11th; San Diego, 93°, 9th; Los Angeles, 101°, 8th; 103°, 9th; 104°, 10th; 112°, 11th; Cajon Rancho, 112°, 9th; 107°, 10th; Holloway's, 105°, 11th; Spring Valley, 111° to 122°, 11th; Campo, 101°, 11th; Stanwix, 108°, 11th.

Ranges of temperature.—The largest diurnal ranges have been: 37°, Saint Mark's, 2d; 38°, Bismarck, 9th, Virginia City, 15th, and Burlington, Vt., 24th; 39°, Breckenridge, 22d; 40°, Cheyenne, 16th and 27th, Santa Fé, 7th; 41°, Mason, Tex., —; 44°, Denver, 27th. The largest monthly ranges have been: 50°, Dubuque and Omaha; 51°, Alpena; 53°, Bismarck; 55°, Cheyenne; 56°, Denver, Dodge City, and Mason; 57°, Santa Fé; 59°, Breckenridge; 61°, North Platte.

Frosts were observed as follows: Vermont, 1st; Wyoming Territory, 2d; Iowa, Missouri, and Texas, 8th; Dakota, Iowa, Minnesota, and Nebraska, 9th; Iowa, Texas (severe), Minnesota, and Nebraska, 10th; New York, Ohio, and Virginia, 11th; Minnesota and Vermont, 12th; Maine, 20th; Maine, Michigan, New York, Ohio, and Vermont, 23d; 30th, entire month at Summit, Colo.

The formation of *ice*, rather than frosts, was reported from Rockford, Iowa, on the 10th; Moorhead, Minn, 9th; thin coating of ice formed upon the barrels of water at Camp Sheridan, Nebr., 10th, morning; on the 9th, ice formed at Cheyenne and North Platte.

PRECIPITATION.

In general.—The general distribution of rain for June is shown on Chart No. III, from which it will be seen that the region of largest rain-fall extends from Western Tennessee to Indian Territory, and thence northward over Illinois, Iowa, and the lower portion of the Ohio Valley. Rather heavy rains have also fallen at a few points on the South Atlantic coast. Light rains have fallen in Canada, and almost none in California. This distribution of rain over the country east of the Rocky Mountains may be described as being almost directly the inverse of the distribution for June, 1874. The table of comparative values given on Chart No. III shows a very large excess of rain in the South Atlantic States, Tennessee, Upper Mississippi Valley, Lower Missouri Valley, and Minnesota.

Special heavy rains.—The following are the most notable cases of heavy rains that have been reported: On the 1st and 2d at Saint Louis, 3.32 inches. 4th, Denison, Texas, 2 inches in twenty minutes. 6th, Kingston, R. I., estimated 10 inches; 6th and 7th, New London, 4.37; Independence, Kansas, 2.62 inches in 40 minutes. 7th and 8th, Leavenworth, 3.83. 8th and 9th, Memphis, 13.37. 10th, 11th, and 12th, Kittyhawk, 7.33. 11th and 12th, Cape Hatteras, 5.85; Wilmington, 4.86; 11th, 12th, and 13th, Smithville, N. C., 4.46; and Jacksonville, 5.73. 12th, Savannah, 4.80; Cape Hatteras, 3.94; Charleston, 3.96. 12th and 13th, Tybee Island, 4.14. 14th, Mobile, 4.37. 19th, 20th, and 21st, Keokuk, 3.63. 21st, 22d, and 23d, Saint Mark's, 3.08. 29th, Breckenridge, 3.28; Saint Paul, 3.48 (of which 2.41 fell in 1 hour). 30th, Vevay, Ind., at the close of the remarkably violent storm a heavy shower, lasting five minutes, fell from an apparently cloudless sky; drops were of large size, and, as caught on a sheet of blotting-paper, made circles 2¼ inches in diameter. On the 8th and 9th the rain at Memphis was, at times, a steady pour at the rate of 4 inches per hour; on the same days remarkable rains took place at Helena, Ark., where, from 2¼ p. m. on the 7th to 2 p. m. on the 8th, about 12 inches fell, one-half of which was lost by the overflow of the gauge, and similarly from 11 p. m. of the 8th to 7 a. m. of the 9th over 11 (and possibly 13) inches fell, one-half being lost by overflow. The entire surrounding country was of course flooded with water in a manner never before known.

Small monthly rain-falls.—The following stations report less than 0.5 of an inch; the stations in California and Arizona generally report rain-fall zero or inappreciable: Griffin, Texas, 0.49 inch; Santa Fé, 0.13.

Large monthly rain-falls.—Rain-falls to the amount of 10 inches or more were reported as follows: Charleston, S. C., 10.31; Kittyhawk, 10.97; Leavenworth, 10.00; Memphis, 18.16; Fort Snelling, Minn., 10.69; Saint Mary's, Ga., 11.39; Fort Madison, Iowa, 11.56; Springfield, Mo., 15.20; Helena, Ark., (23?;) Urbana, Ohio, 12.34; Bellefontaine, Ohio, 10.91; Carthagena, Ohio, 17.33; Lewisburg, Ohio, 10.60; Jackson, Tenn. 12.01.

Droughts.—Droughts, injurious to vegetation, have been reported as follows: Connecticut, drought, lasting six weeks, ended on the 8th. Maine, Gardiner, May and June both very dry; severe drought now prevails. Michigan, Northport, vegetation only partially recovered from the drought of May. North Carolina, Attaway, severe drought ended on the 9th. Vermont, West Charlotte, severe drought much relieved by rain of the 16th and 30th; hay-crops will be one-third of the average. Florida, Pensacola, no rains for a month.

Hail-storms.—Hail-storms have been reported as follows: 1st, Wisconsin; 2d, Kansas, Mount Washington; 4th, Kansas; 5th, Nebraska, Pike's Peak; 6th, Kansas, Nebraska; 7th, Tennessee, Indiana; 9th, Illinois, Missouri; 10th, Dakota, Missouri, Pike's Peak; 11th, Illinois, Indiana, Kansas, Michigan, Dakota; 12th, Iowa, Dakota, Michigan; 13th, Indiana; 14th, Nebraska, New York; 15th, Iowa, Nebraska; 16th, New York, Pike's Peak; 17th, Iowa; 18th, Pike's Peak; 19th, Iowa, Nebraska; 20th, Ohio, Florida; 22d, Vermont; 23d, Kansas, Nebraska; 24th, Nebraska; 25th, Nebraska, Iowa, Indiana; 26th, Kansas, North Carolina; 28th, Nevada, West Virginia (near Morgantown, breadth of storm one-half to three-quarters of a mile); 29th, Minnesota, Wisconsin, Nebraska, New York; 30th, Indiana, Nebraska, New York, Ohio, Wisconsin.

Large hail-stones.—30th, Genoa, Nebr., diameter from ½ to 1 inch; 29th, Nilesville, Wis., diameter ½ inch, width of storm-track 10 miles; 25th, Dubuque, Iowa, large as quail's eggs; 11th, terrific hail, LeRoy, Ill.; 30th, Fort Wayne, Ind., flat disks ½ inch diameter.

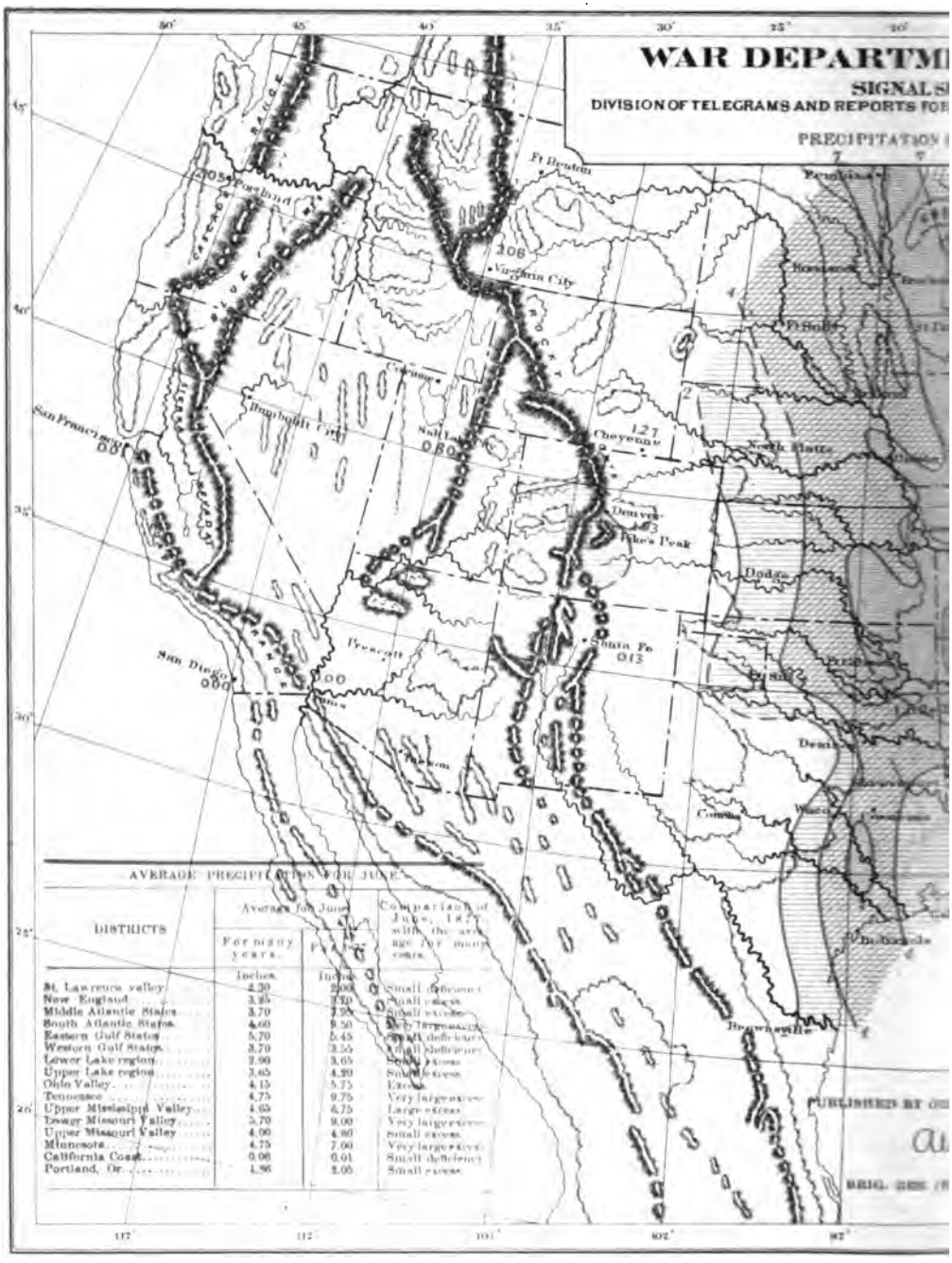
Snow-fall.—At Summit, Colo., the observer reports snow prevalent in the first part of the month, and all traveling done on snow-shoes. On Pike's Peak snow fell on the 1st, 2d, 3d, 4th, 5th, 6th, 7th, 8th, 9th, 11th, 29th. On Mount Washington sleet was reported on the 22d.

Rainy days.—The number of days on which rain has fallen, as recorded by Signal-Service observers, ranges as follows: New England, 11 to 20 days; Middle Atlantic, 10 to 17; South Atlantic, 10 to 16; East Gulf, 9 to 13; West Gulf, 7 to 14; Tennessee and Ohio Valley, 13 to 20; Lower Missouri, 15 to 22; Upper Mississippi, 11 to 19; Upper Lake region, 10 to 20; Lower Lake region, 14 to 20; Rocky Mountain stations, 5 to 7.

Cloudy days.—The number of cloudy days reported during the month, by voluntary observers and Army Surgeons, ranges about as follows: New England, 7 to 15; Middle Atlantic States, 4 to 15; South Atlantic States, 6 to 12; East Gulf States, 8 to 18; West Gulf States, 0 to 8; Tennessee and Ohio Valley, 7 to 14; Lower Missouri Valley, 2 or 3; Upper Mississippi Valley, 5 to 12; Lake region, 5 to 17.

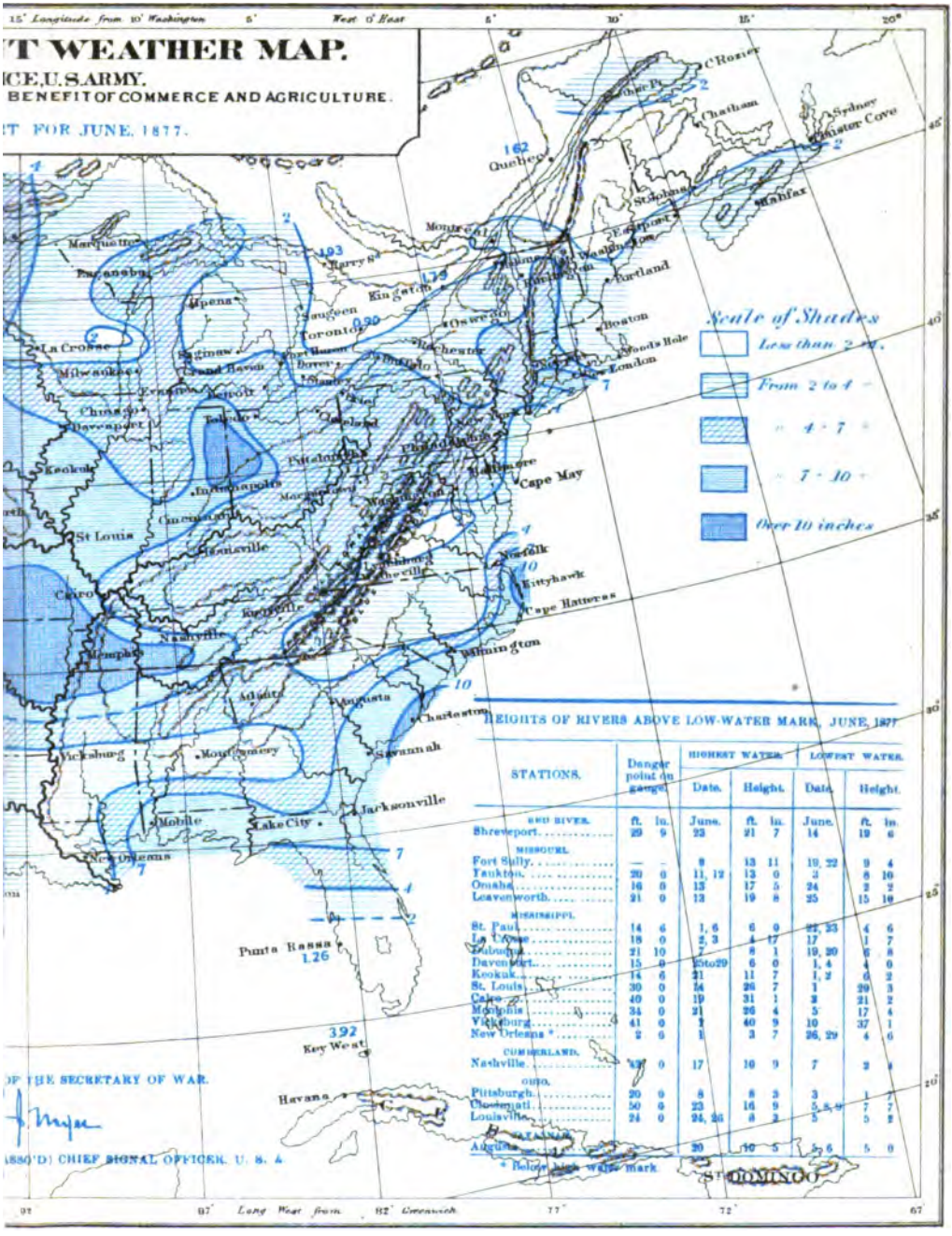
RELATIVE HUMIDITY.

The average relative humidity for the month ranges about as follows: New England, 61 to 79; Middle Atlantic States, 67 to 84; South Atlantic States, 70 to 80; East Gulf States, 65 to 80; West Gulf States, 61 to 74; Tennessee and Ohio Valley, 68 to 72; Lower Missouri Valley, 68 to 71; Upper Mississippi Valley, 64 to 71; Upper Lakes, 67



AVERAGE PRECIPITATION FOR JUNE.

DISTRICTS	Average for June. For many years.	Average for June. For 1872.	Comparison of June, 1872, with the average for many years.
	Inches.	Inches.	
St. Lawrence valley	2.30	2.00	Small deficiency.
New England	3.85	7.70	Small excess.
Middle Atlantic States	3.70	7.25	Small excess.
South Atlantic States	4.60	9.50	Very large excess.
Eastern Gulf States	5.70	5.45	Small deficiency.
Western Gulf States	3.70	3.55	Small deficiency.
Lower Lake region	2.90	3.65	Small excess.
Upper Lake region	3.65	4.30	Small excess.
Ohio Valley	4.15	5.75	Excess.
Tennessee	4.75	9.75	Very large excess.
Upper Mississippi Valley	4.05	6.75	Large excess.
Lower Missouri Valley	5.70	9.00	Very large excess.
Upper Missouri Valley	4.00	4.80	Small excess.
Minnesota	4.75	7.60	Very large excess.
California Coast	0.06	0.01	Small deficiency.
Portland, Or.	1.86	2.05	Small excess.


T WEATHER MAP.
CE, U.S. ARMY.
BENEFIT OF COMMERCE AND AGRICULTURE.
T FOR JUNE, 1877.
Scale of Shades
Less than 2 inches.
From 2 to 4 "
" 4 to 7 "
" 7 to 10 "
Over 10 inches
HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, JUNE, 1877
STATIONS.
Danger point on gauge.
HIGHEST WATER.
LOWEST WATER.
Date.
Height.
RED RIVER.
Shreveport
MISSOURI.
Fort Sully
Yankton
Omaha
Leavenworth
MISSISSIPPI.
St. Paul
La Crosse
Dubuque
Davenport
Keokuk
St. Louis
Cairo
Memphis
Vicksburg
New Orleans
CUMBERLAND.
Nashville
OHIO.
Pittsburgh
Cincinnati
Louisville
Augusta
* Below high water mark.
OF THE SECRETARY OF WAR.
ASS'T) CHIEF SIGNAL OFFICER, U. S. A.
Punta Rassa
1.26
392
Key West
Havana
ST. DOMINGO
Long. West from Greenwich

to 74; Lower Lakes, 65 to 74; San Francisco, 66. High stations, uncorrected for altitude, report as follows: Mount Washington, 83; Cheyenne, 38; Salt Lake City, 30; Santa Fé, 20; Pike's Peak, 76; North Platte, 54; Dodge City, 66; Virginia City, 44.

WINDS.

In general.—The prevailing winds at Signal-Service stations are shown by arrows on Chart No. II, from which it will be seen that, with scarcely an exception, south and southwest winds have been most numerous at all stations east of the Rocky Mountain slope. Northerly winds have prevailed in Oregon and California.

Total movements.—The largest total movements are as follows: Breckenridge, 9,205 miles; Cape Hatteras, 9,463; Cape Lookout, 10,378; Dodge City, 9,940; Indianola, 10,735; Kittyhawk, 9,184; North Platte, 10,712; Pike's Peak, 18,894.

Smallest movements.—Augusta, 2,418; Lynchburg, 2,446; Nashville, 2,891; Shreveport, 3,099.

Highest velocities in miles per hour have been: 6th, Dodge City, 60; —, Indianola, 60; 18th and 25th, Indianapolis, 50; 25th, Chicago, 50; 19th, Mount Washington, 72; 22d, North Platte, 86; Pike's Peak, 87; 27th, Fort Whipple, 96.

Local storms, tornadoes, &c., have been reported as follows: Unless specially noted, it is to be understood that the following list of high winds includes only local storms, and not such gales as prevailed simultaneously over a large region. 4th, Mount Carmel, Ill., and Mattoon, Ill., 5.45 p. m., track 1 mile long and 100 feet wide. 5th, waterspout in Elkhorn Valley, Nebr.; terrific wind and rain, Charleston, Ill. 6th, Chambersburg, Pa., waterspout. 7th, peculiar hot, dry, violent wind, Stockton, Cal. 9th, 5 miles north of Gainesville, Ga., heavy thunder-storm. 14th, tornado at Rosemont, Dakota County, and at Langdon, 12 miles from Saint Paul, Minn., at about 8 p. m.; Northampton and Hadley, Miss. 17th, Memphis, tornado; this occurred within an area of high barometer and of prevailing southerly winds; at 7 p. m. a huge black mass advanced northeastward from a bank of clouds with a low rumbling sound; as it passed over Memphis intense darkness and terrific noise prevailed; the Signal-Service observer standing on the roof of his building was undisturbed, while objects 25 or 30 feet distant to the southeast of him were destroyed; the violent wind occupied 3 or 4 minutes in passing him, and was followed by torrents of rain; the width of the belt of destruction was 200 yards or less, and its track about a mile long, turning from southwest to northeast. 18th, Fort Wayne, Ind., tornado unroofing buildings; Mount Auburn, Ohio, 20th, Plattsmouth, Nebr., and Carthagena, Ohio. 21st, Saint Joseph, Missouri, tornado, also throughout Eastern Pennsylvania. 22d, North Platte, terrific sand-storm, much damage; Brookhaven, Miss., severe local storm; New Ulm, Tex., tornado. 23d, Plattsmouth, Nebr., tornado. 24th, Leavenworth, Kans., destructive storm. 25th, Elmira, Ill., destructive local storm; Merom, Ind., 5 p. m.; Fort Wayne, Ind., tornado from the southwest unroofing buildings. 26th, Denison, Tex., southerly gale, considerable damage; Fort Whipple, Va. 27th, Fort Gibson, destructive gale. 29th, New Ulm, Minn., violent local storm, and tornado 6 miles west of Minneapolis. 30th, tornado passed east of Saint Louis; extraordinary hail-storm at Lafayette, Ind.; Vevay, Ind., remarkably violent thunder-storm; storms in Morgan, Johnson, Shelby, Decatur, Rush, Wayne, and Henry Counties, Ind., also near Saint Louis, Mo., Richmond, Ky., and the central portion of Ohio.

An especial investigation of the tornado of the 4th, at Mount Carmel, Ill., has been made by the Signal Service, of which the following is a preliminary report: The first intimation of the approach of the tornado was the gathering of threatening clouds in the west about 4.30 p. m., portending a severe thunder-storm. Suddenly two heavy clouds, of a black or dark-blue color above, and dun color beneath or on the sides, apparently disconnected themselves from the general mass of clouds, one moving from the northwest and the other from the southwest, the two converging and forming a junction about two miles west of the town; from these two clouds the tornado, which first struck the earth about one and a half miles west of the town, in a heavy piece of timber, developed. After traveling about a mile through the woods and over several farms, sweeping away fences, trees, and houses which lay in its track, which was at this time 60 to 75 yards in width, it made an upward leap and cleared the ground for nearly half a mile, descending to the ground again just west of the town. With a terrific crash and a deafening roar a whirling column swept centrally through the town, its general course being west-southwest to east-northeast. Its transit through the town, a distance of nearly three-quarters of a mile, could not have occupied more than half a minute, and may have been less, while the duration of the destructive blast at any one given point, from many accounts rendered, did not exceed eight or ten seconds. In a track about 125 yards in width the destruction was complete. Houses were not only leveled with the ground, but in some instances were entirely blown away, and trees were uprooted and hurled for long distances. From 75 to 100 yards on either side of the main track the destruction of buildings, &c., was only partial, growing gradually less toward the outer edges. After passing through the town the tornado crossed

the Wabash River and plunged into the dense forest on the Indiana side, where it continued its work of destruction for four or five miles, when it apparently spread out and dissipated.

On the 24th a tornado and water-spout passed from west to east about two and one-half miles north of Fort Lyon (Las Animas), Colo. It was seen to originate to the northeast of the fort, forming from a dense black cloud, which was seen to throw down and then retract a long arm almost to the earth several times in succession, about 4 p. m. Finally, at 5 p. m., there was seen a rapid rotary motion, confined to a heavy, dark cloud in the northwest, when there set in to the west of it a rapid whirl, carrying up from the earth a vast column of dust, which advanced from the west and formed a continuous column with the current in the cloud. Suddenly a water-spout formed in the center of the whirl; it passed across the prairie with a terrific noise; hail of a very large size descended with the water in the center of the whirl; the violent wind unroofed the railroad depot, demolished a switch-house, &c. The track, as examined next day, appeared to be about 500 yards wide. Pieces of ice fell "so large that they could not be grasped in one hand."

The storms of the 25th merit special attention. The weather maps of the 23d, 24th, and 25th show that southerly winds prevailed, with high temperatures, from Texas northward to Central Missouri and eastward over the Ohio Valley; these were on the 24th deflected into southwest winds, with low barometer No. IX, to the westward. Numerous local rains were reported on the 24th in Missouri. Between 11.30 p. m. of the 24th and 12.30 a. m. of the 25th a small area of cool northerly winds descended south and southeastward through Nebraska and Iowa, accompanied by heavy rain, which was very severe at North Platte at midnight, and extended to Dodge City, Kans., where light rain prevailed from 11.30 p. m. to 11.50 p. m., and to Omaha, where it continued until 7.15 a. m. During the afternoon of the 25th an additional flow of air from the north over Iowa and Wisconsin re-enforced that from Nebraska, and on the 4.35 p. m. map a belt from lake Michigan to Dubuque, and thence to the southwest corner of Iowa, divided the southwest winds (temperature 72° to 83°) from the north winds (temperature 59° to 72°). By 11 p. m. of the 25th this dividing belt had been pushed up northward to Northern Wisconsin, Central Michigan, and Lake Erie. Meanwhile a remarkable series of local storms had occurred over portions of Iowa, Missouri, Illinois, Indiana, and Ohio, in the region of warm southeast to southwest winds. These local storms individually moved from southwest to northeast, while the recorded times of their occurrence show that they were successively generated farther and farther to the south and east. At 11 a. m. of the 25th, according to a special dispatch to the Associated Press, storms were prevailing as far east as Peoria and Springfield, Ill., as far south as Springfield, Ill., and as far north as Madison, Wis.; in Iowa the weather was generally clearing, except in the eastern border. By 12.30 or 1 p. m. numerous storms had prevailed over Illinois; between 1 and 4 p. m. they had overrun Illinois; between 3 and 7 p. m. they had overrun Ohio, the last record being 7 p. m., in Guernsey County. A second set of storms occurred after 9 or 10 p. m. over these same States.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily weather indications, with the telegraphic weather reports for the succeeding twenty-four hours, shows a general percentage of omissions of 0.25 per cent., and of verifications of 86.5 per cent. Out of 3,591 predictions, 2,582, or 71.9 per cent., have been fully verified; 362, or 19.1 per cent., have been three-fourths verified; 454, or 12.6 per cent., have been one-half verified; 96, or 2.7 per cent., have been one-fourth verified; 97, or 2.7 per cent., have failed. The percentage for the four elements have been: Weather, 94.5; wind, 85.2; temperature, 86.5; barometer, 79.6. The percentages of verifications by geographical districts have been: New England, 84.6; Middle Atlantic States, 91.4; South Atlantic States, 83.1; East Gulf States, 89.2; West Gulf States, 90.1; Lower Lakes, 86.6; Upper Lakes, 82.0; Tennessee and the Ohio Valley, 86.1; Upper Mississippi Valley, 85.0; Lower Missouri Valley, 85.1.

Cautionary signals.—During the month 74 cautionary signals have been displayed at stations on the Gulf and Atlantic coasts and the Lakes. Of these 59, or 80 per cent., were justified by subsequent high winds within 100 miles of the stations for which they were ordered, and 15 or 20 per cent. were not justified, so far as known. Sixty-one instances of high winds, when no signals were displayed, have also been reported from these stations. Telegraphic communications with the North Carolina coast-stations has continued interrupted during the month.

NAVIGATION.

Stages of water.—In the table on Chart No. III are given the highest and lowest readings on the river-gauges of the month. It will be seen that the Red River remained moderately high during the month at Shreveport, the water reaching its highest stage on the 23d. The Cumberland reached its maximum height at Nashville on the 17th,

and was generally low during the month. The Ohio was lowest from the 3d to the 9th, after which several small freshet waves, the results of heavy showers, passed down. The most important of these was that which reached Cincinnati on the 23d and Louisville on the 26th. The Mississippi continued moderately high during the month from Keokuk down, although the water did not rise to any dangerous heights. The nearest approach to the "danger line" was at Vicksburg on the 1st, but the river fell slowly at this point until the 10th. Above Keokuk no important changes occurred, and the channel continued sufficiently deep for navigation. The Missouri has remained very high at most points during the entire month. At Corinth, Mo., on the 13th, the water was higher than it had been since July 5, 1873, flats, lumber-yards, and smelting-works were flooded, extinguishing the fires in the latter, without doing serious damage. 10th, overflows at Independence, Kans.; 11th, overflows in the Elkhorn in Nebraska and the Arkansas at Little Rock.

Icebergs were reported on the 9th, latitude 43° 44′ N., longitude 49° W.; on the 10th, latitude 43° 19′ N., longitude 48° 53′ W.

TEMPERATURE OF WATER.

In general.—The temperature of water, as observed in rivers and harbors, is shown in the small table on Chart No. II. The average temperatures have been lowest at Eastport, 39°; Marquette, 44.5°. They have been highest at Augusta, 81°; Charleston, 78.5°; Galveston, 78.5°; Jacksonville, 77.5°; Knoxville, 78°: Mobile, 82.5°; Montgomery, 81.5°; Nashville, 78.5°; Saint Louis, 74.5°; Saint Mark's, 77°; Savannah, 78°; Wilmington, 79°.

Maximum and minimum temperatures.—The highest maxima have been: Jacksonville, 85°; Augusta, 86°; Galveston, Mobile, and Montgomery, 87°. The lowest minima have been: Duluth, 45°; Marquette, 42°; Eastport, 37°.

Ranges of temperature.—The least ranges have been: Eastport, 4°; Marquette, 5°. The greatest ranges have been: Galveston, 17°; New London, 16°; Jacksonvile, 15°; Omaha, Saint Paul, and Yankton, 14°.

ATMOSPHERIC ELECTRICITY.

Thunder-storms were reported at stations as follows: 1st, Illinois, Indiana, Kansas, Massachusetts, Michigan, Nebraska, Vermont, Wisconsin, Missouri; 2d, Maine, Illinois, Indiana, Kansas, North Carolina, Ohio, Tennessee, Vermont, New York, Missouri, New Hampshire; 3d, Colorado, Illinois, Indiana, Iowa, Kansas, Michigan, New Jersey, New York, Ohio, Pennsylvania, Wisconsin, Connecticut, Indian Territory, Texas, District of Columbia; 4th, Virginia, Dakota, Illinois, Indiana, Iowa, Kansas, Massachusetts, Nebraska, New York, North Carolina, Ohio, Texas, Missouri, Indian Territory, Maine, Kentucky, Georgia; 5th, Maryland, Colorado, Illinois, Indiana, Massachusetts, Nebraska, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, West Virginia, Mississippi, Texas, District of Columbia; 6th, Maryland, Rhode Island, Utah, Colorado, Connecticut, Dakota, Georgia, Illinois, Iowa, Kansas, Massachusetts, Missouri, Nebraska, New Hampshire, New Jersey, New York, Pennsylvania, Virginia, North Carolina, Florida; 7th, Alabama, Colorado, Connecticut, Dakota, Illinois, Indiana, Kansas, Massachusetts, Missouri, Nebraska, New Jersey, New York, Ohio, Tennessee, Texas, Iowa, Indian Territory, Florida; 8th, Virginia, Illinois, Indiana, Kansas, Michigan, Nebraska, Ohio, Tennessee, Texas. Vermont, Missouri, North Carolina, West Virginia, Florida; 9th, Virginia, Dakota, Illinois, Indiana, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Vermont, Georgia; 10th, Dakota, Florida, Iowa, Missouri, Nebraska, New Hampshire, New York, Wisconsin, South Carolina, Georgia, New Mexico; 11th, Canada, Florida, Illinois, Indiana, Michigan, Nebraska, New York, Ohio, Wisconsin; 12th, Indiana, Iowa, Michigan, Nebraska, New York, Ohio, Dakota, Wisconsin; 13th, Illinois, Indiana, Kansas, Michigan, Mississippi, Nebraska, Ohio, Pennsylvania; 14th, Minnesota, New York, Connecticut, Illinois, Iowa, Massachusetts, Michigan, New Jersey, Ohio, Pennsylvania, Rhode Island, Texas, Georgia; 15th, Ohio, Canada, Illinois, Indiana, Iowa, Michigan, Mississippi, Nebraska, New Hampshire, New York, North Carolina, Texas, Vermont, Wisconsin, Colorado, Dakota; 16th, Michigan, Ohio, Canada, Connecticut, Dakota, Illinois, Indiana, Maine, Massachusetts, New Jersey, New York, Pennsylvania, Vermont, Iowa, Kansas, Texas, Florida; 17th, Minnesota, Illinois, Indiana, Iowa, Missouri, Nebraska, North Carolina, South Carolina, Tennessee, Virginia, Wisconsin, Kansas; 18th, Illinois, Indiana, Iowa, Maryland, Michigan, Nebraska, New Jersey, North Carolina, Ohio, South Carolina, Tennessee, Virginia, Wisconsin, Georgia, West Virginia, Florida, Colorado, District of Columbia; 19th, Connecticut, Dakota, Illinois, Indiana, Iowa, Louisiana, Maine, Minnesota, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Vermont, Virginia, South Carolina, Texas, Florida, Kentucky, Georgia; 20th, Minnesota, Canada, Colorado, Georgia, Illinois, Indiana, Iowa, Michigan, Missouri, Nebraska, New Jersey, North Carolina, Ohio, Tennessee, Texas, Virginia, Wisconsin, South Carolina, Kansas, Indian Territory, Florida, Dakota; 21st, Maryland, Connecticut, Dakota, Delaware, Florida, Georgia, Indiana, Iowa, Kansas, Massachu-

setts, Michigan, Missouri, New Jersey, New York, Ohio, Pennsylvania, South Carolina, Texas, Vermont, Virginia, Rhode Island, Tennessee, Alabama, Indian Territory, West Virginia, Kentucky, District of Columbia; 22d, Alabama, Dakota, Florida, Georgia, Illinois, Louisiana, Massachusetts, Mississippi, New York, Pennsylvania, Texas, South Carolina, North Carolina, Nebraska, Minnesota; 23d, Minnesota, Dakota, Florida, Iowa, Kansas, Missouri, Nebraska, Georgia, Colorado; 24th, Alabama, Michigan, Florida, Illinois, Indiana, Iowa, Kansas, Missouri, Ohio, South Carolina, Tennessee, Kentucky, Dakota, Minnesota; 25th, Kansas, Maryland, Dakota, Illinois, Indiana, Iowa, Michigan, Missouri, Nebraska, Ohio, Massachusetts, Virginia, Minnesota; 26th, Maryland, Minnesota, Texas, Connecticut, Dakota, Delaware, Illinois, Kansas, Michigan, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, Massachusetts, West Virginia; 27th, Dakota, Indiana, Iowa, Kansas, Maryland, Missouri, Nebraska, New York, Pennsylvania, Texas, Virginia, Wisconsin, South Carolina, Tennessee, North Carolina, Alabama, Georgia; 28th, Dakota, Florida, Iowa, Kansas, Missouri, Nebraska, New York, South Carolina, Virginia, Wisconsin, Pennsylvania, Michigan, North Carolina, West Virginia; 29th, Minnesota, Iowa, Kansas, Missouri, Nebraska, New York, North Carolina, Rhode Island, Vermont, Wisconsin, Dakota, New Hampshire, West Virginia; 30th, Rhode Island, Connecticut, Illinois, Indiana, Iowa, Massachusetts, Michigan, Nebraska, New York, Ohio, Pennsylvania, Vermont, Wisconsin, Missouri, Florida.

Distant thunder or lightning was reported as seen from stations in the respective States as follows: 1st, Colorado, Illinois, Indian Territory, Kansas, Texas, Kentucky, Vermont; 2d, Illinois, Indiana, Iowa, Indian Territory, Kansas, Maine, Missouri, New Hampshire, New York, North Carolina, Ohio, Pennsylvania, Tennessee, West Virginia, Wisconsin; 3d, Illinois, Iowa, Indian Territory, Kansas, Missouri, Nebraska, New York, New Mexico; 4th, District of Columbia, Dakota, Illinois, Indian Territory, Iowa, Kentucky, Missouri, Nebraska, North Carolina, Pennsylvania, Virginia; 5th, Alabama, Colorado, Dakota, Florida, Georgia, Iowa, Kansas, North Carolina, New Jersey, New York, Ohio; 6th, Colorado, Dakota, District of Columbia, Illinois, Iowa, Kansas, Maine, Mississippi, Missouri, New York, Virginia; 7th, Colorado, Georgia, Illinois, Iowa, Kansas, Mississippi, Missouri, New York, North Carolina, Tennessee, Texas; 8th, Alabama, Florida, Georgia, Illinois, Iowa, New Jersey, North Carolina, Tennessee, Texas; 9th, Georgia, Missouri, North Carolina, Tennessee, Vermont; 10th, Dakota, Iowa, Indian Territory, Kansas, Missouri; 11th, Iowa, Michigan, Missouri, New York, Wisconsin; 12th, Iowa, Kansas, Missouri, Nebraska, New York; 13th, Colorado, Illinois, Indiana, Kansas, Kentucky, Mississippi, North Carolina, Ohio, Texas; 14th, District of Columbia, Illinois, Iowa, Kansas, Massachusetts, Mississippi, Nebraska, New Hampshire, New Jersey, New York, Pennsylvania, Wisconsin; 15th, Dakota, Illinois, Indiana, Iowa, Kansas, Mississippi, Michigan, New Hampshire, New York, Texas, Vermont, Wisconsin; 16th, Dakota, Indiana, Iowa, Kentucky, Massachusetts, New Hampshire, New Jersey, New York, Ohio, Tennessee, Vermont, West Virginia; 17th, Dakota, Iowa, Kansas, Kentucky, Missouri, Minnesota, Ohio, Tennessee, Virginia, West Virginia; 18th, Illinois, Iowa, Kansas, Kentucky, Maryland, Missouri, New Hampshire, New Jersey, North Carolina, Tennessee, Virginia, West Virginia; 19th, Alabama, Dakota, Illinois, Iowa, Kansas, Kentucky, Minnesota, Mississippi, Missouri, Nebraska, North Carolina, New York, Tennessee; 20th, Colorado, Georgia, Illinois, Iowa, Kansas, Michigan, Mississippi, Missouri, North Carolina, New York, Tennessee; 21st, Dakota, Illinois, Indiana, Kentucky, Louisiana, Massachusetts, Mississippi, North Carolina, New Jersey, New York, Texas, Vermont; 22d, Dakota, Kansas, North Carolina, Texas; 23d, Alabama, Dakota, Iowa, Kansas, Kentucky, Louisiana, Missouri; 24th, Iowa, Indian Territory, Kentucky, Michigan, Nebraska; 25th, Dakota, Illinois, Indiana, Iowa, Indian Territory, Kansas, Kentucky, Michigan, Missouri, Nebraska, North Carolina, Pennsylvania, Tennessee, Wisconsin; 26th, Alabama, Dakota, Indiana, Indian Territory, Kansas, Kentucky, North Carolina, New Jersey, New York, Ohio, Pennsylvania, Tennessee, Texas, Virginia; 27th, Dakota, Georgia, Kansas, Massachusetts, Nebraska, North Carolina; 28th, Dakota, Florida, Georgia, Louisiana, Michigan, Nebraska; 29th, District of Columbia, Florida, Georgia, Iowa, Kansas, Maine, Michigan, Missouri, Nebraska, North Carolina, New York, Ohio, Vermont, West Virginia; 30th, Illinois, Iowa, Kentucky, Louisiana, Massachusetts, Michigan, Missouri, New York, Ohio, Pennsylvania, Tennessee, West Virginia.

Auroras were observed as follows: 2d, Minneapolis, Minn. 3d, La Crosse. 4th, Mount Forest, Canada; Jacksonville, Fla. 6th, Vevay, Ind.: Bismarck; Alpena. 7th, New Ulm, Minn.; Saint Paul; Minneapolis, Minn.; Rochester; Grand Haven; Washington, D. C. 8th, Bismarck. 10th, Westerville, Ohio. 11th, Fort Preble, Me.; Bangor; Gardiner, Me; Burlington, Vt.; Minneapolis, Minn.; Boston, Mass.; Albany; Rochester; Oswego. 13th, Monticello, Iowa; Duluth; Bangor; Alpena. 14th, Rochester; La Crosse; West Charlotte, Vt. 17th, Bangor. 22d, Fort Mackinaw; Atco, N. J.; Saint Paul. 23d, Atco, N. J. 28th, Bangor.

Ground currents.—Disturbances on lines of telegraph have been reported as follows: At Mason, Tex., on the 10th; at Pike's Peak, Colo., on the 3d; at Santa Fé, N. Mex., on the 18th.

OPTICAL PHENOMENA.

Solar halos were observed on the 1st, Connecticut, Kentucky, Massachusetts, New York, Rhode Island, Texas; 2d, Canada, Connecticut, New York, Ohio; 3d, Georgia, Nebraska, New York, Ohio, Texas; 4th, Florida, Alabama, Illinois, Nebraska, North Carolina, New Hampshire; 5th, New York; 6th, Illinois, Iowa, Kentucky, Nebraska; 7th, California, Dakota, Minnesota, Nebraska, New York, Ohio; 8th, Connecticut, Delaware, New York, Ohio, South Carolina; 11th, Dakota, New Hampshire; 12th, Alabama, Illinois, Kansas, Louisiana, Maine, Massachusetts, New Hampshire, New York, Pennsylvania; 13th, Illinois, Kentucky, Ohio, Texas; 14th, Indiana, Iowa, Kansas, Maine, New Hampshire, New York, Ohio; 15th, Alabama, Michigan, New York, Ohio; 16th, Georgia, Ohio; 17th, Illinois, New Jersey; 18th, Massachusetts, New Hampshire, New Jersey, New York, Ohio, Wisconsin; 19th, Illinois, Massachusetts; 20th, Connecticut, Michigan, Ohio; 21st, Connecticut, Massachusetts; 22d, Illinois; 23d, Illinois, Massachusetts, New Hampshire, New York; 24th, Colorado, Massachusetts, New Hampshire, Connecticut, Rhode Island; 25th, Kentucky, Michigan, New Hampshire; 26th, Illinois, Kansas, Kentucky, Missouri, Nebraska; 27th, Connecticut, Illinois, Iowa, Kentucky, Maine, New York, Ohio, South Carolina; 28th, Illinois, Iowa, Maine, New Hampshire, New York, Ohio, Wisconsin; 29th, Illinois, Indiana, Kansas, Michigan, Ohio, South Carolina; 30th, Kentucky, North Carolina, Ohio.

Lunar halos were observed on the 1st in Canada; 3d, Ohio; 13th, Indiana; 16th, Georgia, Massachusetts, Pennsylvania; 17th, Connecticut, Delaware, Georgia, Illinois, Indiana, Maryland, Minnesota, Ohio, Virginia, District of Columbia; 18th, Dakota, Georgia, Kansas, Illinois, Louisiana, Massachusetts, Minnesota, Nebraska, Ohio, South Carolina; 19th, Illinois, Kansas, Minnesota, South Carolina, Utah; 20th, Illinois, Louisiana, Michigan, Ohio; 21st, Georgia, Illinois, Iowa, South Carolina, Virginia; 22d, Alabama, Indiana, Iowa, Illinois, Ohio, Texas, Virginia; 23d, Connecticut, Indiana, Maine, Minnesota; 24th, Michigan, South Carolina; 25th, Rhode Island; 26th, Alabama, California, Georgia, Kentucky, Ohio; 27th, Indiana; 28th, New York; 29th, Ohio; 30th, Illinois, Ohio.

Mirage was observed at Barnegat, N. J., and Atlantic City, N. J., on the 25th.

MISCELLANEOUS PHENOMENA.

Zoological.—BOTANICAL.—Harvesting began as follows: *Barley*, 18th, Jacksonburg, Ohio; 19th, Vevay, Ind.; 30th, all in at Clarksville, Tex. *Oats*, 30th, all in at Clarksville, Tex.; 17th, heading out at Creswell, Kans. *Rye*, 27th, Vevay, Ind.; 30th, Wappinger's Falls, N. Y. *Wheat*, 8th, Carbondale, Ill.; 12th, winter-wheat heading out, Creswell, Kans.; 17th, spring-wheat heading out at Creswell, Kans.; 17th, Alto Vista, Va.; 18th, Wappinger's Falls, N. Y.; 27th, Vevay, Ind., and Salem, N. J.; 28th, Jacksonburg, Ohio; 29th, Keokuk, Iowa; 30th, Clarksville, Tex., all in; 30th, Ringgold, beginning; 30th, Ruggles, nearly ripe. *Clover*, 1st, Wautoma, Wis., in bloom; 25th, Jacksonburg, Ohio. *Hay*, 18th, Salem, N. J.; 25th, Wappinger's Falls, N. Y.

FRUITS.—Blooming and ripening, are reported as follows: *Blackberries*, in bloom, 5th, Cornish, Me.; 7th, Palermo, N. Y. *Cherries*, ripe, 15th, Wappinger's Falls, N. Y. *Currants*, ripe, 18th, Wappinger's Falls, N. Y.; Augusta, Ill., 28th. *Grapes*, blooming, 4th, Augusta, Ill.; 18th, Contoocookville, N. H.; Concords ripe, in good exposures, 28th, Lake Charles, La. *Peaches*, ripe, 20th, Brookhaven, Miss. *Peas*, in bloom, 6th, Jacksonburg, Ohio; ripe, 7th, Wappinger's Falls, N. Y.; 15th, Starkey, N. Y.; 29th, Jacksonburg, Ohio. *Potatoes*, ripe, 29th, Jacksonburg, Ohio. *Mulberries*, ripe, 20th, Augusta, Ill. *Raspberries*, ripe, 26th, Wappinger's Falls, N. Y.; 27th, Augusta, Ill. *Strawberries*, ripe, 2d, Augusta, Ill.; 10th, Gardiner, Me. (two weeks early); 10th, West Charlotte, Vt.; 13th, Starkey, N. Y.; 18th, Contoocookville, N. H.

FLOWERS AND TREES.—*Daisies*, flowering, 14th, Somerset, Mass. *Locust-tree*, in bloom, 5th, Somerset, Mass. *Roses*, in bloom, 3d, Wappinger's Falls, N. Y. *Syringia*, in bloom, 10th, Somerset, Mass. *Tulip-tree*, in bloom, 3d, Richmond, Ind. *Water-lilies*, in bloom, 5th, Fall River, Mass. *Yarrow*, in bloom, 17th, Palermo, N. Y.

BIRDS.—First seen as follows: *Cuckoo* 6th, and *Kingbird* 12th, at Monticello, Iowa.

INSECTS.—*Chintz-bugs* were first seen: 1st, at Guttenberg, Iowa. *Caterpillars*, myriads at Sycotte Station, near Chicago. *Bees*, 18th, Summit, Colo. *Crickets*, 2d, at Somerset, Mass. *House-flies*, 13th, Summit, Colo.; 29th, Richmond, Ind. *Katydid*, 19th, Brookhaven, Miss. *Fire-flies*, 1st, Jacksonburg, Ohio; 7th, Augusta, Ill.; 8th, Freehold, N. J., Woodstock, Vt.; 10th, Palermo, N. Y.; 13th, Corning, Mo.; 14th, Linden, N. J.; 15th, Newark, N. J. *Colorado beetle*, 14th, Linden, N. J., few; 20th, Riley, Ill., hatching; 24th, Starkey, N. Y.; 26th, Blooming Grove, Pa., few; 30th, Ringgold, Ohio, not destructive; Waltham, Mass., very destructive; Dunbarton, N. H., slight damage.

Locusts.—Special reports in reply to the circular of the United States Entomological Commission afford the following extracts: Fredericksburg, Tex., have visited this section regularly in April and September of each year since 1870, leaving after four or

six weeks; were this year less numerous and destructive than formerly; left the first week of May. Eagle Pass, Tex., were numerous and destructive in September, 1873; eggs hatched in February, and were destructive in May, 1874; another destructive swarm in September, 1875; eggs hatched in February, and young ones left in May, 1876, doing little damage; no new swarms in 1877; a few hatched out from old eggs. Cambridge, Tex., a few stopped here in July, 1876, on their way southwestward; a few arrived May 7, 1877, and left within twenty-four hours. Indianola, Tex., locusts have never been seen hereabouts within thirty miles of the Gulf coast. Leavenworth, Kans., immense swarms of locusts arrived 10th to 15th of August, 1874, and left in about six days, followed by native grasshoppers; many young ones hatched out, and were full-fledged 25th May, 1875; visited by very few in 1876. Dodge City, Kans., grasshoppers (locusts?) frequent from April to September, 1876; arrived May 21, 1877, at 10.30 a. m., and continued flying to the northeast until the 22d, 5 p. m.; deposited no eggs. Denver, Colo., was visited in 1864, '65, '66, '73, '74, '75, '76 (July 30th); many young hatched in 1877, but died early. Breckenridge, Minn., visited in 1874, '75, '76; hatching rapidly May 15 to 31, 1877. Corsicana, Tex., swarms arrived September 21, 1876, staying five days, and October 1st, staying nine days; young hatched out 1877, from February 5th to 20th; departed between 1st and 21st of May. Special notes for June are as follows: Nebraska: Plattsmouth, not destructive, but plentiful; North Platte, 15th, few flying north; Howard, hatching until June 15th; flying 20th to 30th, little damage. Dakota: Bismarck, 21st, 28th, 29th, flying northwest. Colorado: Denver, 30th, very few have hatched. Kansas: Baxter Springs, 12th to 30th, flying northeast; plenty remain in cold soils. Iowa: Vail, 30th, began to fly; Tabor, 30th, all gone. Missouri: Corning, plenty but not destructive. New Jersey: South Orange, 30th, all gone; little damage: Newark, 15th, slight damage; Vineland, 1st, plentiful; 14th, very few. District of Columbia: Washington, plentiful first ten days. New York: Starkey, 25th, seen; Wappinger's Falls, 1st, hatching; 13th to 18th, destructive; 26th, dying. Virginia: Alto Vista, 15th, all gone.

Balloon ascensions.—Some information as to the condition of the atmosphere on June 18th and 19th, is given by the observations made during two balloon voyages starting from Nashville. The path of the balloon is shown on the accompanying chart IV. The observations will be presented in full in the annual report of the Chief Signal-Officer; they show that the bases of the cumulus clouds were formed at an altitude corresponding to the pressure of 25.50 inches at 5.40 p. m., but of 27.85 inches at 8 a. m., the temperature of their bases being, respectively, 79° and 78°. The highest point attained was at pressure 16.65 inches (where the temperature was 43° and the wet-bulb thermometer read 36°) on June 19th, 11.55 a. m., at which time the record at Nashville Signal-Service station (altitude 504.2 feet) was 29.58, 86.5, 75.5, respectively.

Polar bands.—Guttenberg, November 22d; Carthagena, Ohio, 1st, 3d, 13th, 22d, 29th; Denver, Colo., 5th, 12th, 25th.

Sunsets.—The characteristics of the sky, as indicative of approaching fair or foul weather, have been observed daily, at sunset, at all Signal-Service stations. The monthly means from 97 stations show that 74 doubtful cases, or blanks, were recorded, and that out of the remaining 2,832 cases, 2,162, or 76.3 per cent., have been followed by the expected weather.

Forest fires prevailed in Northern Michigan during the first ten days of the month, being generally extinguished by rain on the 9th. Fire or smoke was also reported as follows: 1st, Greenville, N. C.; 3d, 4th, 5th, Kittyhawk, N. C. (in marshes); 4th, Southington, Conn.; 6th, Hennepin, Ill.; 15th, 23d, Detroit, Mich.; 23d, West Waterville, Me.; 30th, Santa Fé, N. Mex. (for several days).

Meteors were observed as follows: 1st, Davenport, Iowa; 3d, Carthagena, Ohio; 11th, Monticello, Iowa; 12th, Mount Auburn, Ohio; Louisville, Ky.; Indianapolis, and Fort Wayne, Ind., and Detroit, Mich.; 13th, Litchfield, Mich. (10 p. m.), Bellefontaine, Ohio; 14th, Monticello, Iowa, Philadelphia, Pa.; 15th, Carboudale, Ill. (northwest to southeast), Mount Sterling, Ill.; 16th, Waterburg, N. Y.; 17th, Monticello, Iowa; 19th, Merom, Ind.; 20th, Merom, Ind.; 21st, Leavenworth, Kans.; 24th, Davenport; 25th, Point Pleasant, La.; 26th, Point Pleasant, La.; 27th, Brook Haven, Miss.; 28th, Monticello, Iowa, Starkey, N. Y.; 29th, Point Pleasant, La. (zenith to southeast, and meteoric shower), Brook Haven, Miss., Freehold, N. J. (11 p. m. loud explosion), Newark, N. J.; 30th, Summit, Colo., Brook Haven, Miss., Salem, N. J. (10 p. m.), Melissa, Tex., (8 p. m.,) Bloomfield, Wis. (10.40 p. m.), followed by explosion in 3 to 5 minutes.

Zodiacal light.—Carbondale, Ill., 19th to the 28th. Savannah, Ga., 1st, 2d, 3d, 6th, and 30th.

Earthquakes.—3d, near Stanford, Ky., small local disturbance; 11th, volcanic disturbance 60 miles from Yuma, near Flowing Well, Cal.; 18th, Milwaukee, 7.30 p. m., water in Lake Michigan fell two feet in one-half hour, and rose again much more quickly.

SOLAR PHENOMENA.

Sun-spots.—The following observations, made by Mr. D. P. Todd, upon the spots on the sun, have been kindly communicated by Rear-Admiral John Rodgers, U. S. N., Superintendent of the Naval Observatory:

June, 1877.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
11— 5 p. m.	1	13±	0	0	0	0	1	13±	Spots very small and closely aggregated.
13— 9 a. m.	0	0	0	0	0	0	0	0	
19— 9 a. m.	0	0	0	0	0	0	0	0	
20— 9 a. m.	0	0	0	0	0	0	0	0	
21—10 a. m.	0	0	0	0	0	0	0	0	
22—10 a. m.	0	0	0	0	0	0	0	0	
23— {8 a. m.	0	0	0	0	0	0	0	0	Several prominent groups of sizeable faculæ.
23— {6 p. m.	1	2	0	0	0	0	1	2	
24— 1 p. m.	0	0	0	0	0	0	1	2	
25— 8 a. m.	0	3	0	0	0	0	1	5	
26—10 a. m.	0	1	0	0	0	0	1	6	
27— 9 a. m.	0	0	0	0	0	0	0	0	Solar disk almost completely mottled with faculæ, many of them large.
29— 6 p. m.	1	2	0	0	0	0	1	2	
30— 9 a. m.	0	0	0	0	0	0	1	2	Several large faculæ; one of the spots is penumbral—quite without dark or well-defined nucleus.

Professor Tacchini reports to the Paris Academy of Sciences that "on the 3d a small spot (the only one) appeared in the east, and gradually enlarged to 40s., by the 7th continuing of this size (some small spots which presently appeared with it ever changing) till it was near the border on the 13th. On the 14th, when projection and photography revealed hardly a trace of the group, the spectroscope discovered very lively chromospheric flames; higher up, several oblique fragments, evidently from violent eruption, eruption flames on the right, and lastly, a nebulous chromospheric mass, well illuminated and slightly divergent. There was constant commotion of matter."

NOTES AND EXTRACTS.

Prof. R. Wolf communicates to the Quarterly of the German Astronomical Association (Vol. II, p. 87) a report on his sun-spot investigations, as follows: "I have continued the observation of the condition of the solar spots (a work begun by me at the end of 1847 in extension of the work of Schwabe and Schmidt, and since then prosecuted uninterruptedly) at least once in every clear day, and very frequently many times and with different telescopes, and have thus obtained, for 270 days of the year 1876, the number g of visible groups and number f of their constituent spots and points, whence I have by the formula $r = k(f + 10g)$ computed the relative number r as first introduced by me in 1850. In this k indicates a certain factor, depending upon the observer and instrument; it is assumed as unity for myself using a magnifying power of 64 applied to a four-foot Fraunhofer refractor, and is for other observers or instruments to be deduced from corresponding series of observations. By supplying the record on days that were cloudy at Zurich from other observations made by Messrs. Weber in Peckeloh, Schmidt in Athens, Denza in Moncalieri, Tacchini in Palermo, I find r equal 11.3 as the mean of all the relative numbers for each day of the year 1876, and in connection with the mean relative numbers of the previous years I have the series:

Year.	r.	Year.	r.
1867	7.3	1872	101.7
1868	37.3	1873	66.3
1869	73.9	1874	44.6
1870	139.1	1875	17.1
1871	111.2	1876	11.3

In which the periodicity of the sun-spot phenomena is clearly shown.

Prof. E. Loomis communicates to the American Journal of Science the following conclusions:

1. Areas of low barometer result from a general movement of the atmosphere towards a central area, and this movement is accompanied by a deflection of the wind to the right, which causes a tendency to circulate around the center with a motion spirally inward.

2. This deflection to the right, which results from the earth's rotation, causes a diminished pressure within the area of this inward movement, and the pressure is still further diminished by the centrifugal force resulting from the circulation about a center.

3. The amount of the barometric depression depends upon the force of the wind and the geographical extent of the revolving atmosphere. The effect of centrifugal force is not considerable except when the velocity of the wind approaches that of a hurricane. With a velocity of one hundred miles per hour, the depression due to centrifugal force may amount to about two inches; but in the winter storms of the middle latitudes with a velocity not exceeding 40 miles per hour, the depression due to centrifugal force seldom exceeds one or two tenths of an inch. In these storms, three-quarters of the observed depression of the barometer is usually the effect of the earth's rotation; but in order that the depression at the center may amount to as much as one inch, it is generally necessary that this system of circulating winds should prevail over an area nearly 2,000 miles in diameter.

[*To be continued in July Review.*]

Published by order of the Secretary of War.

ALBERT J. MYER,
Brig. Gen. (Brevet-Assigned) Chief Signal-Officer, U. S. A.

PAPER 38.

Correspondence of the Chief Signal-Officer of the Army (through the honorable Secretary of War and the honorable Secretary of the Interior) with the Entomological Commission appointed by the honorable Secretary of the Interior to report upon the migrations of the Rocky Mountain locust, and also regarding its appearance, habits, and devastations in the Western States and Territories.

DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SECRETARY,
Washington, April 24, 1877.

SIR: By a provision of the "Act making appropriations for sundry civil expenses of the government for the year ending June 30, 1878," the Secretary of the Interior was authorized to appoint a commission of three skilled entomologists to report upon the depredations of the Rocky Mountain locusts in the Western States and Territories, and the best practicable methods of preventing their recurrence or guarding against their invasions.

To carry out the purposes of this law, I have appointed a commission, consisting of Prof. Charles V. Riley, of Saint Louis, Mo., Dr. A. S. Packard, jr., of Salem, Mass., and Prof. Cyrus Thomas, of Carbondale, Ill.—three gentlemen well qualified by their attainments and experience to conduct such investigation. They are now prepared to enter upon their duties, and they desire that the Signal Service of the Army shall co-operate with them by furnishing information in regard to the temperature and humidity of the atmosphere, prevailing winds, &c.

I have the honor to transmit herewith a letter from Dr. Packard, the secretary of the commission, setting forth particularly the items of information desired.

This department is desirous that these investigations may result in some practical benefit to the country. I have, therefore, the honor to commend the request of the commission to your favorable consideration.

Very respectfully,

C. SCHURZ,
Secretary.

The honorable THE SECRETARY OF WAR

[Copy of inclosure to above communication.]

DEPARTMENT OF THE INTERIOR,
OFFICE OF THE UNITED STATES ENTOMOLOGICAL COMMISSION,
Salem, Mass., April 14, 1877.

SIR: In behalf of the United States Entomological Commission, appointed to investigate the habits and migrations of the locust of the West, I write to ask the co-opera-

tion of the Weather Signal Bureau in furthering the objects of the Entomological Commission.

The Signal Service can aid the said commission in the following manner:

1st. By the communication of meteorological data collected during the present year, as observed in the United States west of longitude 93°, the data to be arranged under the following heads: Mean temperature, mean relative humidity, prevailing winds, and total movement for each month from March until and including November. Should additional data seem to you desirable, they will be thankfully received.

2d. It is desirable to have as full information as possible from the Weather-Signal observers regarding the habits, times of hatching, and migrations of the locust; *i. e., Caloptenus spretus.* A circular will shortly be issued soliciting information regarding the habits of the locust and inquiries, which it is desirable to have answered. It is important that each observer stationed west of longitude 93° should receive a copy and return it with answers. The United States Entomological Commission would like to send this circular, as well as a pamphlet, to be afterward published, to each observer at once, either through the Weather-Signal Bureau or by mail direct, upon receiving from your office the address of the observers, as may seem to you most feasible. The beneficial effects already exerted by the Weather-Signal Service upon agriculture and commerce may possibly in this way be extended, and the time come when the Weather-Signal Service may be able to predict the coming of seasons of undue heat and dryness. Consequently, the entomologist will be able to foretell with more or less certainty the undue and periodical return of noxious insects, and particularly the western locust.

Hoping that the Weather-Signal Service may thus lend its most valuable and necessary aid to the Entomological Commission,

I remain, very respectfully, your obedient servant,

A. S. PACKARD, JR.,
Secretary United States Entomological Commission.

Bvt. Brig. Gen. A. J. MYER, U. S. A.,
Chief Signal-Officer.

WAR DEPARTMENT,
Washington City, May 23, 1877.

SIR: I have the honor to transmit herewith a letter of the 19th instant from the Chief Signal-Officer United States Army to Mr. A. S. Packard, jr., secretary United States Entomological Commission, in reply to his communication relative to observation and report on the movements and habits of locusts west of the 93d meridian; also, copy of a circular issued by the Chief Signal-Officer to the Observer-Sergeants of the Signal Corps, whose stations are embraced within the region where said observations are called for.

Very respectfully, your obedient servant,

GEO. W. McCRARY,
Secretary of War.

The honorable THE SECRETARY OF THE INTERIOR.

[Inclosure to above communication.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL-OFFICER,
Washington, D. C., May 19, 1877.

SIR: The Chief Signal-Officer has the honor to acknowledge the receipt of your communication, forwarded through the Hon. Secretary of the Interior and the Hon. Secretary of War, relative to the observation and report of the habits and movements of locusts west of the 93d meridian, and, in reply, to inform you that your request will be most cheerfully complied with.

A circular-letter has already been issued to the Signal-Service observers in the field of observation (copy inclosed), and it is requested that the circular to which you refer in your communication be forwarded to this office for distribution to the several stations. Although the inclosed letter calls for a great portion of the data requested, still a printed list of questions to be answered by the observers and to be framed by the commission would assure a more reliable and condensed report.

Assuring you of the greatest interest in this investigation, the Chief Signal-Officer is anxious to lend all possible assistance, and hopes that the work may prove of practical benefit to the country.

I am, sir, very respectfully, your obedient servant,

ALBERT J. MYER,
Brigadier-General (Brevet Assigned), Chief Signal-Officer of the Army.

Mr. A. S. PACKARD, Jr.,
Secretary of the United States
Entomological Commission, Salem, Mass.

(Through the Hon. George W. McCrary, Secretary of War, and Hon. Carl Schurz, Secretary of the Interior.)

[Copy of inclosure to above communication.]

WAR DEPARTMENT, OFFICE OF THE CHIEF SIGNAL-OFFICER,
DIVISION OF TELEGRAMS AND REPORTS FOR THE
BENEFIT OF COMMERCE AND AGRICULTURE,
Washington, D. C., May 17, 1877.

SERGEANT: Should the Rocky Mountain locust appear at or near your station at any time during the present year, you will obtain all the information possible relative to the following subjects, viz:

The date of appearance of the locusts; the direction from which they came; the direction and velocity of wind and character of weather at time of appearance; the length of time they remain in your neighborhood, and amount of damage done by them; the direction and velocity of flight; direction of flight when they leave your station; whether they fly with or against the wind; whether or not they laid eggs in great quantities in the surrounding country; what means were taken to destroy the eggs or the locusts; any other information you can obtain on this subject. Should the locusts have arrived at your station previous to the receipt of this communication, you will obtain all the information possible from the citizens residing near you and forward it without delay to this office.

Make full notes in your daily journal in regard to locusts and forward the same with the abstract.

Very respectfully,

CHAS. E. KILBOURNE,
First Lieutenant Second United States Artillery, A. S. O., and Assistant.

Sergeant ——— ———,
Signal Service, U. S. A.

WAR DEPARTMENT,
Washington City, June 14, 1877.

SIR: At the request of the Chief Signal-Officer, I have the honor to inclose a copy of a communication from A. S. Packard, jr., secretary of the United States Entomological Commission, and have respectfully to inform you that the circulars referred to by Mr. Packard have been distributed, and instructions given requiring the same to be returned to the Chief Signal-Office with full report.

When received the reports will be duly forwarded to the secretary of the commission.

Very respectfully, your obedient servant,

H. T. CROSBY,
Chief Clerk,
(For the Secretary of War, in his absence.)

The honorable THE SECRETARY OF THE INTERIOR.

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL-OFFICER,
Washington, D. C., June 9, 1877.

SIR: I have the honor to inclose an official copy of a communication from A. S. Packard, jr., secretary of the United States Entomological Commission, and request that the Hon. Carl Schurz, Secretary of the Interior, be informed of the receipt of this letter and notified that the circulars referred to by Mr. Packard have been distributed, and instructions given requiring the same to be returned to this office with full report, and that these reports will be duly forwarded to the secretary of the commission.

I am, sir, very respectfully, your obedient servant,

ALBERT J. MYER,
Brigadier General (Brevet Assigned), Chief Signal-Officer of the Army.

The honorable THE SECRETARY OF WAR.

[Copy of inclosure to the above communication.]

DEPARTMENT OF THE INTERIOR,
OFFICE OF THE UNITED STATES ENTOMOLOGICAL COMMISSION,
Saint Louis, May 26, 1877.

SIR: I have the honor to acknowledge the receipt this day of your letter of May 19, and the accompanying circular-letter (copy), and the copy of the letter of transmission of the honorable the Secretary of War, in relation to the observation of the habits and migration of the western locust by the observers of the United States Signal Corps.

In behalf of the United States Entomological Commission, I beg leave to heartily thank you for the ready and cordial interest which you have taken in the matter. We

send to the office of the Chief Signal-Officer two hundred copies of our circular to be sent to the Signal-Corps observers, in accordance with your suggestions.

Very respectfully, yours,

A. S. PACKARD, JR.,
Secretary United States Entomological Commission.

ALBERT J. MYER,
Brig. Gen. (Brevet Assigned), Chief Signal-Officer U. S. A.

[Copy of inclosure to above communication of A. S. Packard, jr.]

Circular No. 1.

[C. V. Riley, chief, Saint Louis, Mo. A. S. Packard, jr., secretary Salem, Mass. Cyrus Thomas, disbursing agent, Carbondale, Ill. Headquarters, northwest corner Sixth and Locust, Saint Louis, Mo. Eastern office, Hayden's Survey, Washington, D. C.]

DEPARTMENT OF THE INTERIOR,
OFFICE OF THE UNITED STATES ENTOMOLOGICAL COMMISSON,
——— ———, 187 .

Mr. ——— ———:

DEAR SIR: The commissioners are desirous of collecting, as soon as possible, all ascertainable facts in reference to the migrations of the Rocky Mountain locust (*Caloptenus spretus*), and also regarding its appearance, habits, and devastations in your section.

We present below a series of topics upon which we shall be glad to receive data from your locality. We expect you to dwell only on those topics upon which you have positive information, and shall be glad to receive any facts or views not suggested by this circular. Some of the subjects cannot be reported on till toward the approach of winter, while others can be considered earlier. In responding, therefore, we ask our correspondents to couple their answers with the number of the circular and of the inquiry.

We shall be glad to receive and will determine any of the different species of locusts that occur in your locality, and particularly specimens of their different parasites and natural enemies. These are best forwarded by mail, packed in cotton, moistened with alcohol, and placed in secure tin or wooden boxes.

The inquiries have reference more particularly to the present year 1877, and when facts are communicated that have reference to other years, correspondents will please be careful to specify the particular year.

The commissioners will refund whatever expense may be incurred for postage in replying to this circular or in forwarding specimens, should correspondents so desire.

Copies of documents published by the commission will be sent to correspondents who forward data in accordance with this request. Communications may be sent to either of the commissioners by the above addresses.

CHAS. V. RILEY.
A. S. PACKARD, JR.
CYRUS THOMAS.

TOPICS ON WHICH DATA ARE REQUESTED.

1. Date and time of day of the arrival of swarms.
   1*a*. Direction and force of the wind at the time.
   1*b*. Temperature and character of the weather at the time (clear or cloudy).
   1*c*. Direction of the flight, density, height, and extent of the swarms.
2. Date and time of day of the departure of swarms.
   2*a*. Direction and force of the wind at the time.
   2*b*. Temperature and character of the weather at the time.
   2*c*. Direction of the flight, density, and extent of the swarms.
3. Date when the first eggs, if any, were deposited the present year.
4. Date when the eggs were most numerously hatching the present year.
5. Date when the eggs were most numerously hatching in previous years.
6. Proportion of eggs that failed to hatch the present year and probable cause of such failure.
7. Nature of the soil and situations in which the eggs were most largely deposited.
8. Nature of the soil and situations in which the young were most numerously hatched.
9. Date at which the first insect acquired full wings.
10. Date when the winged insects first began to migrate.
11. Estimate the injury done in your county and State.
12. Crops which suffered most.
13. Crops most easily protected.
14. Crops which suffered least.

15. The prevailing direction in which the young insects traveled, and any other facts in relation to the marching of the young.
16. The means employed in your section for the destruction of the unfledged insects, or to protect crops from their ravages, and how far these have proved satisfactory.
17. The means employed in your section for the destruction of the winged insects, or to protect crops from their ravages, and how far these have proved satisfactory.
18. Descriptions, and, if possible, figures of such mechanical contrivances as have proved useful in your locality for the destruction of either the young or the winged insects.
19. If your section was not visited in 1876, please state this fact.
20. If visited any previous year, please give the dates.
21. To what extent have birds, domestic fowls, and other animals, domestic or wild, been useful in destroying these insects?

[Indorsement on above circular sent to sergeants Signal Service, U. S. A.]

OFFICE OF THE CHIEF SIGNAL-OFFICER,
Washington, D. C., June 9, 1877.

SERGEANT: Collect and forward to this office the data requested in this circular.

Very respectfully,

C. E. KILBOURNE,
First Lieutenant Second U. S. Artillery, A. S. O., and Assistant.

Sergeant ——— ———,
Signal Service, U. S. A.

PAPER 39.

The following extracts relative to the *Rocky Mountain locusts* are made from the abstracts of daily journal and special reports received from stations west of the Mississippi River:

BISMARCK, DAK.

Grasshoppers first observed at noon June 21, 1877, flying toward the northwest, at an altitude of about one-half mile. A few have just been found outside the town.
Grasshoppers seen flying southeast to northwest July 21, 1877.
July 24.—Flying northwest at noon in small numbers.
July 25.—Flying north in large numbers; many alighted.
July 26 *and* 27.—Abundant; flight with wind; many alighted and remained.
July 28 *and* 29.—Abundant in air and on ground.
July 31.—Abundant in air and on ground.

BOERNE, TEX.

The locusts appeared about the latter part of October, 1876, in very large numbers coming from the northwest, remaining several weeks, depositing their eggs about one or two inches below the surface of the ground, and disappeared suddenly in a northwesterly direction. Direction of wind at the time of their coming cannot be ascertained.
The first young appeared in the first days of March, 1877. At noon of May 7, 1877, they began to move directly north. A light and gentle north and west wind prevailed, changing to fresh and gentle west and east winds. By the 10th of May there were scarcely any to be seen.

BRECKENRIDGE, MINN.

Young grasshoppers appeared thick in some places May 11, 1877. On July 3 a good number of locusts passed over, flying toward the northwest with the wind.
Temperature ranging from 70° to 77°.
July 5. Flying generally to west, with wind, which was light; very warm.
July 6. Flying toward northwest with the wind; warm weather.
July 11. Flying toward northwest with the wind.
July 13. Flying north with the wind; weather warm.
July 14. Flying north with the wind; weather very warm.
July 19 and 20. Flying southward with the wind.
July 22. Flying northward with the wind; warm weather.
By July 26 they had generally left the place. Some few were seen on the 30th, flying north with the wind.

CAMBRIDGE, TEX.

Locusts arrived May 7, 1877, at 11, a. m.; weather clear, wind southwest and fresh; velocity not known. General direction of flight was north. They departed within twenty-four (24) hours after their arrival, traveling to the north; exact time of departure not known. Force of wind not known; direction of wind not given; weather sultry.

CONCHO, TEX.

No information can be obtained as to whether this section has ever been visited by the locusts.

CORSICANA, TEX.

Two swarms of locusts visited this section in the year 1876. The first appeared at 9 a. m., September 21, and the second at 10 a. m., October 1, flying south; wind northwest, with a velocity of from 8 to 10 miles per hour; weather clear and dry; temperature 76° and 70°.

The first swarm remained five and the second nine days, departing south with a fresh northerly wind; weather fair; temperature 70°.

This place was visited by locusts in 1867 and at a time previous, but date cannot be obtained.

In 1877 they were most numerous from May 9 to 12, disappearing about the 20th. In many places they were observed traveling before they winged, and always in a northerly direction. The winged ones have been observed to rise very high to take their flight, and invariably take a direction north of east, and always fly with the wind.

DENISON, TEX.

Young locusts hatched about first of April, 1877. As soon as able to fly they moved northward in large swarms.

Flight began May 15 and continued until the 26, when none were to be seen.

The velocity of their flight was estimated at twenty miles per hour; wind blowing south.

DENVER, COLO.

This section was visited by locusts in 1864, 1865, 1866, 1873, 1874, 1875, 1876, and a great number hatched in 1877.

In 1876 they were first noticed July 30; wind south and gentle; weather fair to cloudy; temperature ranging from 63° to 93°. They flew in no particular direction; no reliable record of departure. Most of those hatched in 1877 died.

EAGLE PASS, TEX.

The only locusts that appeared in 1877 were those hatched from eggs of locusts descendants of the swarm of September, 1875. Their number is insignificant. They remain in this locality.

FREDERICKSBURG, TEX.

The locusts left about the first week of May. The direction of their flight could not be ascertained, but it was believed they were going north.

Weather was hazy, with a light south wind; temperature about 70°.

FORT GIBSON, INDIAN TERRITORY.

Locusts: September 16, 1876, grasshoppers began to hop.
September 17, 1876.—Grasshoppers thickening rapidly.
September 18, 1876.—Grasshoppers demolishing everything.
September 28, 1876.—Grasshoppers going south.
April 13, 1877.—Grasshoppers have appeared in sufficient numbers to destroy gardens
May 14, 1877.—Grasshoppers have disappeared.

GALVESTON, TEX.

This immediate vicinity, as well as the entire coast country of the State, for a breadth of from twenty-five to seventy-five miles, has never been visited by the insects (locusts). In the interior of Texas, the locusts of 1877 generally developed from eggs de-

posited in the fall of 1876, and did not arrive from a distance. They commenced traveling northward about March 10, and by May 15 none were to be seen. Their direction of flight was north and west.

Hatching began January 25, 1877, and ended about March 10; most numerously hatched between February 15 and March 1. No eggs were deposited during present year.

GRAHAM, TEX.

Locusts seen almost daily from May 12 to 25, 1877, flying north, with a fresh to brisk south wind.

INDIANOLA, TEX.

The Sergeant reports that Rocky Mountain locusts have never visited this place, never having approached nearer than thirty miles of the coast.

MASON, TEX.

The flight of the locusts of 1877 began May 15. They generally appear with a north or northwest wind, and leave with a south or southeast wind.

NORTH PLATTE, NEBR.

Grasshoppers were seen at 10 a. m. May 29, 1877, flying from a little east of south, and with the wind. By 2.30 p. m. none were visible. Wind blowing at a rate of from 20 to 30 miles per hour.

A few locusts seen flying June 5, 1877. Weather clear, wind south and southeast. Locusts did not alight.

OMAHA, NEBR.

August 23, 1876.—About noon the grasshoppers commenced passing to the south; surface-wind blowing from southeast, and light. They continued flying over till August 26, when they were observed flying in circles, finally disappearing.

A small number were seen on the 13th.

In 1877, the young grasshoppers hatched from eggs deposited by the locusts of the fall of 1876 made their appearance in May.

PEMBINA, DAK.

Grasshoppers first noticed in 1876; on July 8, flying a little north of east.
July 9.—Flying northeast.
July 11.—Flying southeast.
July 12.—Flying south-southeast.
July 13.—Flying south; wind northwest.
July 17.—Flying southeast.
July 20.—Flying southeast.

PIKE'S PEAK, COLO.

July 11, 1876.—Large numbers of grasshoppers (locusts) were seen drifting with the wind southeast, and blowing at the rate of twenty-five miles per hour.

PILOT POINT, TEX.

Locusts appeared in September, 1876, and remained about three weeks. They came from a northwest direction.

On May 1, 1877, the locusts hatched from the eggs deposited by the swarm of September, 1876, commenced flying in a north direction, wind brisk north, velocity seventeen miles per hour.

Several swarms coming from the south with the wind have alighted here, but their stay has been transient, they resuming their flight northward.

SALT LAKE CITY, UTAH.

September 28, 1876.—Clouds of grasshoppers (locusts) are reported to have passed over the city this morning.

STOCKTON, TEX.

June 7, 1877.—Ranchmen say that a few Rocky Mountain locusts have been seen, but not in sufficient numbers to damage crops. No eggs are being hatched.

SAINT PAUL, MINN.

From reports and from conversation with others, grasshoppers are and have been quite numerous in this State; but very few are to be seen in this vicinity, and farmers are much exercised in mind as to the best means to secure their speedy and effective destruction or extirpation. To this end, and with some degree of success, they have devised many contrivances, simple and complex; but the wholesale devastation at first expected from their incursions and subsequent propagation does not appear to have been well founded.

Great damage has, however, been done by them in Stearns, Douglas, Brown, Kandiyohi, and Nicollet Counties. In all other parts of the State their work of destruction is very much less, and the people are becoming less apprehensive daily.

More minute or comprehensive information on this subject, it is hoped, can be soon furnished in response to circular received from office of the Chief Signal Officer.

These pests seem to have a partiality for prairie-lands and products, as timber-lands, with apparently as much or greater inducements, do not suffer near as much from them. It is reported that, as they become winged and strong, they fly toward the Canadas, the wind being favorable.

VIRGINIA CITY, MONT.

June 30, 1876.—Myriads of grasshoppers around station, and the same reported all over the Territory. Millions are in the streets, houses, and offices. They are just beginning to fly since the 27th. The gardens around the city are damaged but little, but the newspapers report them very destructive in the central portion of the Territory. Citizens say they will leave as soon as their wings are fully developed.

July 11, 1876.—Myriads of grasshoppers were flying a little south of west, and continued, with no apparent diminution in numbers, until the 19th, when their numbers began to decrease, and by the 20th none were passing over the station.

July 27, 1876.—Grasshoppers were again seen flying to the southeast, their number increasing to myriads on the 29th, and continued until the 9th of August, on which date rain and snow occurred, and, until the 16th, none are reported; but on the latter date they are reported flying south in small numbers, and so continued until August 28, 1876, except on the 23d and 25th, on which days it rained.

The observer states that the cessation of grasshopper flight from the 20th to the 27th of July, 1876, was doubtless due to stormy weather, as, when the wind is against their flight they settle down. By inquiries of veracious citizens he learns that the bands northward extend fifty miles, and southward ten miles (doubtless farther). They fly from about 11 a. m. to 5 p. m., then settle in valleys, sheltered from the wind. Much damage was done on ranches in certain localities. One ranch was entirely devastated, while one adjacent was uninjured.

In August, bands of grasshoppers were not as numerous nor as extensive as in July, and ranchmen are confident of large crops for the next season, as no eggs have been deposited. No grasshoppers seen in 1877.

YANKTON, DAK.

July 27, 1876.—Swarms of grasshoppers were flying from the northwest and settling all day.

July 28, 1876.—Grasshoppers still settling from the north.

July 29, 1876.—Gardens nearly destroyed by grasshoppers.

July 31, 1876.—Grasshoppers seemingly busy laying eggs, probabilities being that the country will be completely eaten out next year.

August 5, 1876.—Innumerable grasshoppers darkening the sky, flying south.

August 23, 1876.—A few grasshoppers flying east.

August 24, 1876.—A few grasshoppers moving from the northwest.

The observer remarks, "There were a great number of grasshoppers about the place in the early part of the month, and almost all the corn was destroyed. About the 10th they began to depart, and in a few days scarcely one was to be seen. No grasshoppers reported in 1877, up to June 30."

PAPER 40.

I have the honor to submit the following report upon the Signal Service section of the Army at the International Exhibition, which opened at Philadelphia, Penn., on the

10th of May, and closed on the 10th November, 1876. The exhibit was made in compliance with the following order:

[Special Orders No. 192.]

OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, D. C., November 20, 1875.

[Extract.]

* * * * * * *

3. In compliance with directions received from the Secretary of War, First Lieutenant F. C. Grugan, Second Cavalry and Acting Signal Officer, is hereby assigned to the duty of collecting, arranging, and displaying at the International Exhibition of 1876, subject to the direction of the chairman of the board on behalf of the United States executive department, such stores, materials, and articles pertaining to the signal service, United States Army, as shall be designated by the Chief Signal Officer to be placed on exhibition.

Lieutenant Grugan will report by letter through this office to Maj. S C. Lyford, Ordnance Department, United States Army, chairman of the above-mentioned board, and representative of the War Department for the necessary information.

By order of the chief signal officer of the Army.

GARRICK MALLERY,
Captain First Infantry, Bvt. Lt. Col. U. S. A., Acting Signal Officer and Assistant.

Upon the receipt of the order, steps were at once taken to collect such Signal Service materials as could be obtained and kept in working order during the exhibition, without exceeding the sum assigned to the Signal Service for the purpose of defraying all the expenses connected therewith. This sum amounted to $6,700, and the smallness of the amount taken in connection with the limited space that could be furnished in the United States government building and with the small working force of enlisted men that could be spared from other duties made it evident that much that would be of interest and instruction to the public at large would need to be omitted. It was finally determined to limit the display to an exhibition of such signal apparatus as was used in the service for the purpose of maintaining communication between bodies of troops in the field, and to establish in the "government building" a Signal Service station in practical operation, similar to the stations located throughout the United States.

In the department of military signaling the display consisted in the regulation equipments and supplies for day and night signals, such as flags, torches, bombs, colored lights, rockets, and heliographs, together with a military field telegraph train fully equipped with its telegraph line in actual operation.

In the meteorological department were exhibited the ordinary station instruments, a full set of the publications of the Signal Office, and a working station illustrating the printing of the weather maps and bulletins, the issuing and posting of bulletins, receiving and transmitting telegraphic weather reports, and such other duties as are usual at a station of observation. Only such self-registering meteorological instruments as were designed by the officers and enlisted men of the Signal Service were exhibited in the section, and in order that they might be seen and examined in actual operation, they were placed under a roof of glass and were supplied with artificial currents of air and water (rain) which for each instrument and by means of stopcocks could be turned on or off at will. Every self-registering instrument, if an electrical one, was furnished with its own battery, and whether electrical or mechanical in its action, was supplied with its respective wind-vane or anemometer, rain or snow gauge, located upon the artificial roof. With all were exposed specimen sheets of the records obtained.

The working force consisted of four sergeants and three privates of the Signal Service.

In compliance with the verbal instructions of the Chief Signal Officer every effort was made to render the Signal Service exhibit an instructive one to the general public. The centennial station was connected by telegraph with the chief office at Washington, D. C., whence were forwarded by telegraph the daily weather-reports received from the numerous stations of the country. Daily Bulletins, Farmers' Bulletins, River-Reports, and Weather-Maps were printed, posted in the different buildings and throughout the grounds, and distributed to the public. Explanations were given of the workings of the service and of the meteorological and signal instruments, and special efforts were made to call public attention to the practical use of the weather-reports and maps, which last-named work was greatly assisted by the numerous copies of circulars on meteorological subjects and weather-maps sent from the Chief Office for general distribution.

* * * * * * *

In the centennial edition of the New York Herald printed daily in "Machinery Hall" at the exhibition appeared, under date of October 13, 1876, a *fac simile* copy of the map issued by the central office at Washington, two and a half hours previous to the print-

of the Herald, and from that date until the close of the exhibition the electric graph enabled the weather-charts to appear in the daily issues of the newspaper. se *fac simile* maps showed the positions of the isobarometric and isothermal lines iously referred to.

description of the instruments designed for the purpose will be found in the de- ptive catalogue at the end of the report.

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opies of these publications and of meteorological charts bearing upon the climate storms of the United States were exposed in the section for general inspection by public.

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escriptive catalogue of articles exhibited in the Signal Service section of the Army at the International Exhibition of 1876.

VISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

The importance of self-recording instruments in furnishing continuous records of eteorological changes is now fully recognized.

Only those devised by members of the Signal Corps are exhibited. The wind instruents and rain-gauges are in actual operation, being supplied by artificial currents of r and water.

Specimens of the record-sheets for examination are exposed with each instrument.

1. *Anemograph (velocity), devised by Private A. Eccard, Signal Service United States my.*—This instrument records the velocity of the wind in miles and tenths of miles. nd-cups, revolving on the roof, close an electric current for every tenth of a mile. e closing of the armature causes a claw to catch in a pinion and to turn a cogged eel, which, acting on a vertical screw, raises and lowers a pencil which makes its ord on ruled blanks attached to two cylinders turned by clock-work. One cylinder lds the daily, the other the semi-monthly, sheet. The screw is so compensated that ien the carriage bearing the pencil travels from top to bottom, or *vice versa*, it indites that fifteen miles of wind have passed. The vertical lines on the sheets give the me. These sheets are changed, the one daily, the other semi-monthly.

2. *Rain-Gauge, devised by Private A. Eccard, Signal Service United States Army.*—This strument, mechanical in its action, records the amount of rain-fall and the moment of beginning and ending thereof, during the twenty-four hours. The rain is collected in a funnel-shaped vessel on the roof of the observing station, conducted through a tube to the gauge, where it flows into a cylinder. In the latter a float is suspended, and as the water rises the float is carried with it. A light silk thread passes from the float over rollers and gives motion to a pencil, which, by traveling over the record-sheet, gives amount of rain-fall and time. As the float rises the pencil sinks, and the figures on the sheet and corresponding lines give the amount of rain-fall. The pencil is also connected with the clock-work which turns the cylinder bearing the record-sheet and registers the amount of water in the gauge every four minutes. The sheet is changed daily.

3. *Anemograph (direction), devised by Private A. Eccard, Signal Service United States Army.*—This instrument records in a constant manner the direction of the wind, as well as its veerings. An extended spindle passes from the wind-vane on the roof to the instrument. At the lower extremity of the spindle a cog-wheel is fastened. This wheel moves an endless screw, on which a pencil travels upward and downward, every shifting of the wind making a corresponding record on the sheet. The sheets are ruled, so that the time of each change in the direction of the wind can be determined. On the ceiling of the room in which the instrument is placed is fixed a ring, bearing the points of the compass in legible letters; a small vane or arrow is attached to the spindle of the large vane, and indicates by the position of the arrow the direction of the wind. The record-sheet on the cylinder is changed daily.

4. *Anemograph, devised by Lieut. D. J. Gibbon, United States Army.*—This instrument furnishes a record of the velocity or force of the wind. The self-register is connected by electrical wires with a Robinson anemometer, this latter consisting of four equal metallic cups in the form of hemispheres attached to the extremities of two arms, which cross each other at right angles, turning freely about a vertical axis. The action of the wind on the concave side of the cups is greater than its action on the convex side, so that a slight breeze is sufficient to make the cups rotate. The dials of the anemometer are connected with the cups, and are graduated so as to indicate the miles or fractional parts of miles traveled by the wind. Two wires lead from an electrical

battery through the register to the dial of the wind-cups exposed to the wind. These wires become a continuous wire only when a spring located in the dial is pressed down by pins fixed on the face of one of the dials at intervals equal to one mile of wind. The closing of this spring allows the electrical current to flow, the magnet attracts the armature in the self-register, which bears a pencil, and the pencil makes its mark on the paper. The cylinder in the register revolves by clock-work. The paper fixed thereon is so ruled as to show fractional parts of the twenty-four hours. The blanks are changed daily at 12 m. By counting the number of pencil marks, the following data can be obtained: Total number of miles of wind during the twenty-four hours, and variations in velocity of wind at any moment during the day or night.

5. *Anemograph, devised by Lieut. D. J. Gibbon, United States Army.*—This instrument furnishes a record of the velocity or force of the wind for every mile and the direction of the wind at intervals of five minutes. The velocity is obtained as described in No. 4. The direction is obtained in the following manner: The N., S., E., and W. points of the wind-vane exposed to the action of the wind are connected each by a distinct wire to the self-register and to an electrical battery. The electrical current is closed or opened every five minutes by a contact-closer in the clock of the anemograph. If pointing to the north, the north wire receives the electrical current, closing its armature and bringing the hammer attached thereto upon the record-sheet on the cylinder.

6. *Rain-gauge, devised by Lieut. D. J. Gibbon, United States Army.*—This instrument has a funnel, cylinder, and float similar to No. 2. A thread from the float passes over a lever bearing a small weight, the latter to keep a constant tension on the thread. As the float rises, the tension is lessened, the lever sinks, closing an electric contact, the armature of the magnet is attracted, and the circuit completed. To the armature is attached a long, vertical, toothed arm, resting in a cogged wheel. When the armature is attracted, the extremity of the arm sinks into a cog of the wheel and turns the spiral, this latter being on the horizontal axis which supports the cogged wheel. The spiral travels across the surface of a sheet fastened to a cylinder turned by clock-work. Every closing of the circuit indicates $\frac{1}{100}$ of an inch rain-fall; the passing of the marker once across the sheet indicates that one-fourth of an inch of rain has fallen. The time of beginning and ending of rain is also indicated by rulings on the paper. An escapement throws the armature from the magnet after each registration. The sheet is changed daily at 12 m.

7. *Evaporograph, devised by Private A. Eccard, Signal Service, United States Army.*—This instrument consists of two parts: first, the vessel containing water, conveniently exposed for determining the amount of evaporation and electrically connected with the second part, or recording apparatus, which may be placed in the observatory or at any distance from the point of exposure.

The vessel containing water is supported upon a float on mercury, and is also connected at its center with a lever, the extremity of which is balanced between two points, communicating with two electro-magnets of the recording apparatus. The fulcrum of the lever is operated in either direction by two additional electro-magnets, the circuits of which are closed by driving-works.

The recording apparatus is provided with two rollers revolved by clock-work, one completing its revolution in twenty-four hours, the other in thirty-one days. Between the rollers is an upright screw, which moves the pencil downward, corresponding to the evaporation, or upward, indicating the rain-fall. The screw carrying the pencil is operated by a double driving work.

When $\frac{1}{1000}$ of an inch of water is lost by evaporation, the weight is sufficiently reduced to cause the lever to touch one of the contact-points, thereby unlocking the gearing, which moves the pencils to correspond with the amount of evaporation. At the same time, the circuit is closed and the lever is readjusted between the contact-points. Each movement of the instrument corresponds to eight times the amount of evaporation, or eight inches on the "blank" correspond to one inch of evaporation. As the variation in weight serves to operate this instrument, it may be used at any temperature, and for recording the amount of snow-fall without the additional trouble of melting.

8. *Thermograph, devised for the Signal Service by G. W. Hough.*—This instrument records the variation in temperature. A shelter contains the thermometer, a siphon-bent tube, the arms of unequal size; the larger containing alcohol, the smaller mercury. On the surface of the mercury rests a small ivory float, which, by means of a thread, is attached to a lever, both arms of which have platinum points. This lever is suspended over two small cups containing mercury. The mercury answers as a conducting medium for the electrical current. The two cups are connected by wires with magnets in the instrument. One armature answers for both magnets. If the temperature in falling causes the mercury to sink, the float goes with it, and the arm of the lever sinks into one of the cups containing mercury, completing an electric current. By means of the wires leading to the magnets, the armature is attracted to its respective magnet, moving a mechanism, which, connected with a vertical screw, turns the latter. A pencil works on the screw-thread in a direction corresponding to the change in the

position of the float (in this case downward), and makes a constant record on the record-sheet fixed on a cylinder turned by clock-work. Another attachment prints the state of the thermometer thereby. Small type are fixed on rotary cogs, and any change in temperature will turn these cogs correspondingly. The record-sheet is carried slowly forward. An eccentric affixed to the hour-wheel of a clock causes a weight to fall on a padded lever, pressing this paper against the numbers on the cogs, and, in this manner, printing the state of the temperature at that time in degrees and tenths. The sheet for numerals is changed daily, the record-sheet semi-monthly.

9. *Barograph, devised by Private H. L. Foreman, Signal Service, United States Army.*—This instrument is constructed on a plan similar to No. 8, with this difference, that the long arm of a lever is placed between two platinum contact-points, and as the mercury rises or falls the upper or lower contact is touched and motion given to a series of cog-wheels, which raise or lower a pencil moving over record-sheets. The sheets on the cylinders are changed, one daily, the other semi-monthly.

An additional attachment consists of a heavy lever-shaped hammer, padded on one side, which hourly presses the record-sheet against type, and prints a record of the hourly barometric reading at the time. This record-sheet is carried forward by clock-work, and is changed daily.

10. *Barograph, devised by Lieut. Henry Jackson, United States Army.*—This instrument records the changes in atmospheric pressure, furnishing a constant record of the barometric condition. It is mechanical in its method of recording. A float resting on the surface of the mercury in the short open arm of the siphon-shaped tube is connected by a thread to one arm of a lever, on the other arm of which a pencil and counterpoise weight are fastened. If the atmospheric pressure increase, that is, if the barometer rise, the mercury in the short arm will sink, with it the float, and the end of the lever bearing the pencil will rise, and make its record on a record-sheet fastened to a cylinder turned by clock-work, by means of mechanism which also connects the pencil with the clock, causing it to strike against the paper every four minutes. The record-sheet is changed daily.

11. *Barograph, devised by Lieut. D. J. Gibbon, United States Army.*—This instrument records the atmospheric changes by means of electricity. A float rests on the surface of the mercury, connects by a thread one arm of a lever, the other arm of which is lengthened out for the purpose of multiplying the motion, and is, at its extremity, tipped with platinum. This end is suspended between two other platinum points, the latter connected with their respective magnets. If the float sink, the lever, moving, throws upward the long arm, touches the upper contact-point, and, completing an electric circuit, attracts an armature, and gives motion to a cog-wheel. This wheel, by means of other wheels, is attached to a vertical endless screw bearing a pencil, which moves over the surface of two cylinders bearing the record-sheets, one of these furnishing a daily, the other a semi-monthly record, and in this manner gives an uninterrupted record of the barometric oscillations. It records a change in the barometer of $\frac{1}{1000}$ of an inch; and the lever is so mounted as to follow the vertical movement of the mercury, thereby allowing the float to rest freely on the mercury after each contact.

12. *Marine Barograph, devised by Lieut. D. J. Gibbon, United States Army.*—This instrument is similar to No. 11, excepting that the two columns of mercury communicate by a contracted opening, 0.1 of an inch in diameter. This contraction, together with the manner of suspending the instrument upon a universal joint, serves to prevent the sudden movement of the vessel from destroying the equilibrium of the mercury.

13. *Printing Press*, for printing the farmers' bulletin.

14. *Imposing-stone.*

15. *Type-stand.*

16. *Map Press*, with changeable weather-signals, for printing the tri-daily War Department weather-map.

17. *Case* containing steel stamps for the issue of stamped weather-maps printed at stations not supplied with printing-presses.

18. *Cipher Book*, used in translating weather reports t legraphed tri-daily from Signal-Service stations to the Washington office; also specimens of original and enciphered reports.

19. *Morse Telegraph Instruments*, by which the tri-daily weather reports are received at the Exhibition from the central office at Washington.

20. *Manifold Bulletin*, in which the weather reports are written after deciphering.

21. *Weather Map*, displayed in boards of trade and chambers of commerce. The discs and arrows showing the state of the weather and direction of the wind at the date of the report; the small tags showing, by the figures written on them, the humidity, thermometer, barometer, and velocity of the wind.

22. *Cautionary Signal Indicator*, displayed in boards of trade and chambers of commerce to announce the approach of storms. The red ball is raised upon telegraphic order from the chief office.

23. *Cautionary Signal Board*, displayed in boards of trade and chambers of commerce,

showing those stations and ports which are on the path of storms considered dangerous by the chief office.

24. *Cautionary Signal Flag*, displayed on stations during the day to announce the approach of storms.

25. *Cautionary Signal Lantern*, displayed on stations during the night to announce the approach of storms.

26. *Instrument Shelter*, so arranged as to provide for a free circulation of the air about the different thermometers used on Signal-Service stations.

27. *Minimum Thermometer*, showing, by the position of the index in the tube, the lowest temperature during the twenty-four hours.

28. *Maximum Thermometer*, giving the highest temperature during the twenty-four hours. The mercury is forced over the small indentation near the bulb, and cannot return of itself. To adjust the thermometer, the tube is revolved rapidly until the mercury reads the temperature of the air.

29. *Standard Thermometer*, used on stations for obtaining the temperature of the air.

30. *Hygrometer*, two bulbs; one kept moist by water, which, by evaporating, gives a difference of reading between the two thermometers. From this difference the amount of moisture in the air is deduced.

31. *Barometer*, used on stations to ascertain the atmospheric pressure.

32. *Water Thermometer*, for finding the temperature of lakes and rivers.

33. *Rain Gauge*, for measuring the amount of rain-fall.

34. *Measuring Stick* for rain-guage.

35. *Robinson's Anemometer*. See No. 4.

36. *Tool Box*, containing tools and supplies for repairing and cleaning meteorological instruments on stations.

37. *Bulletin Board*, containing tri-daily weather reports from Signal-Service stations throughout the United States and Canada, and a copy of Synopsis and Probabilities issued by the chief office at Washington, D. C., announcing the coming weather.

38. *Farmers' Bulletin*, consisting of Synopsis and Probabilities, published for the benefit of commerce and agriculture.

39. *Publications of Office of the Chief Signal Officer and works on meteorology*, used on Signal-Service stations.

40. *Wind Charts*, showing force, direction, and frequency of winds at United States stations, and meteorological maps compiled in the chief office.

41. *Weather Quadrant Maps*, for the United States, showing winds most likely to be followed by rain or by dry weather.

42. *River Oscillation Charts*, showing rise and fall in the rivers of the United States.

43. *Photographs of Signal-Service stations* on Pike's Peak, Colo., Mount Washington, N. H., &c.

DIVISION OF FIELD SIGNALS.

The field-signal division comprise the different modes of communication adopted for the Army and Navy. It embraces: signaling with flags by day and torches by night; by Homographic Code, Chronosemic Signals, Semaphore's, Candle-bombs, Rockets, Colored Fires, Heliograph, &c., &c., and communication by Military Field Telegraph.

The signalling by flags and torches is made by the waving of the flag or torch to the right or left, the letters being formed by one or more motions, either to the right or left or both, words being spelled out, each letter of the alphabet having its signal. If the alphabet be already formed, as soon as intercourse between two signalists is established, the messages can be interchanged. Should there have been no alphabet preconcerted, or should a cipher alphabet be required, it can be formed in a short time by persons instructed in the signal system, though many miles apart, provided they be in sight of each other. Messages have been sent by the signal code a distance of ten miles with a pocket handerkerchief on a ten-foot pole. With the flags and staffs in use in the Signal-Service of the Army, communication has been had at twenty-five miles distance, the Signal-Service field-telescope being used.

The following apparatus is used for signal purposes:

44. *Flags.*—The field equipment consists of three kinds of signal-flags: white, red, or black, of three different sizes, 6 feet, 4 feet, or 2 feet; that color being used which is best suited to the background.

45. *Signal-staff.*—This consists of three joints, each four feet long, and fitted with ferrules to join to each other joint by joint. The second joint is tipped with brass, and is that to which the torch is attached for night-signals.

46. *Torches*, with flame shades and extinguishers; two in number, flying-torch and foot-torch, to be supplied with wick and burning-fluid. The flying-torch, as its name implies, describes to the right or left of the central light or foot-torch motions similar to those made by flags as previously described. Signals are legible at distances varying from ten to twenty miles.

47. *Canteen*, containing supply of burning fluid for torches.

48. *Haversack*, containing articles used in trimming or filling torches.

49. *Canvass Kit-cases*, containing the flags and torches. One case closed, one case open.

50. *Homographic Disks.*—The relative positions obtained by extending the arms to the right or left of the body, or above the head, indicate a signal to be transmitted.

51. *Bombs* are pasteboard shells charged with brilliant stars, and so fitted with fuses that they can be thrown into the air and exploded at a great height. They afford very distinct and marked signals. When prepared for use, there is attached to them an ordinary cartridge of powder fitted with a long match. They are fired from bomb-guns or mortars.

52. *Mortars* consist of hollow cylinders formed of thick pasteboard, sole-leather, or sheet-copper, two or three feet in length, of sufficient diameter to readily admit the bomb, and closed at one end by a block of wood or a plate of some metal.

53. *Colored lights and fires with Signal-Service pistol.*—The use of colored lights for signaling purposes has become quite extended, being employed both by the Army and Navy. The system of communication by these colored lights is based upon the meanings conveyed by an exhibition of different colored flames or lanterns, such as show *single* colors, *white*, *red*, or *green*, or double and triple consecutive colors, *white-red*, or *white-red-green*, &c. Between ships at sea, in cases of distress, or during a war, great difficulty is at times experienced in exchanging messages at night, and the light signals were devised to remedy this defect.

54. *Signal-Service rockets.*—Used for communicating messages at night. They are specially adapted to the chronosemic system, based upon certain intervals of time being allowed to elapse between the explosions of successive rockets. They are regulated by correctly timed fuses.

55. *Field Heliograph and Sighting-rod*, for transmitting messages by sun-flashes. This instrument transmits messages to great distances. Heliograph signals can be read with the naked eye a distance of twenty miles or more.

56. *Heliograph for permanent work.*

57. *Model of portable telescopic elevating tower*, with its wagon.

58. *Portable telescopic elevating tower and wagon*, devised by J. W. Davis, of Washington, D. C., giving an elevation of 75 feet; weight, 1,350 pound; to be used for signal purposes with troops in the field.

59. *Model of United States field-telegraph train.*

60. *Signal-Service telescope.*

61. *Signal-Service field-glass.*

62. *Signal-Service telescope-holder.*

63. *Flying torch and staff*, fitted for use.

64. *Flag (4 feet) and staff*, fitted for use.

65. *Rocket-stand*, for firing rockets.

66. *International signals.*—This code was prepared by a committee appointed by the British board of trade, to inquire into and report upon the subject of a code of signals to be used for communication at sea. It is known as the International Signal Code, and has been generally adopted throughout the world. When once fully adopted, it will be a universal method of intercourse. Its symbols consist of eighteen flags, namely: One burgee, four pennants, and thirteen square flags, representing the eighteen consonant letters of the alphabet, which are used as index letters of the code. There is also, in addition, a code pennant, which is used as "code" signal and "answering" signal. The flags are hoisted in combinations of two, three, and four. Accordingly, the number of possible combinations thus obtainable, each different from the other, is 78,642.

The international code, as its name implies, has been so framed as to be capable of adaptation for international communication, all such words and sentences as can ordinarily be required for any purpose being comprised within its limits. It was adopted in 1873 by the Signal-Service stations established in connection with life-saving stations on the Atlantic coast and Gulf of Mexico. (See "International Code of Signals," published by the Bureau of Navigation, United States Navy Department.)

67. *Fac-simile or autographic telegraphic instrument*, by which the War Department weather-maps, issued at the Chief Signal Office at Washington, are received by telegraph for publication in the New York Herald. The instruments designed for the purpose were designated fac-simile or autographic telegraph, and were the joint invention of W. E. Sawyer, of New York, and James G. Smith, of New Jersey. The motive power consisted of an electro-motor, worked by six cups of nitro-chromic battery. The map or sketch to be transmitted was drawn on ordinary paper, a special ink being used. Powdered shellac was then scattered over the writing, and the impression transferred to a thin plate of heated zinc by being pressed between pressure-rollers, the shellac lines forming an insulating surface upon the conducting surface of the zinc.

The process of transfer occupied about four seconds. The zinc was then placed upon a cylinder, which revolved rapidly under a metallic point, to which a lateral motion was imparted by the working of the instrument. This metallic point was connected

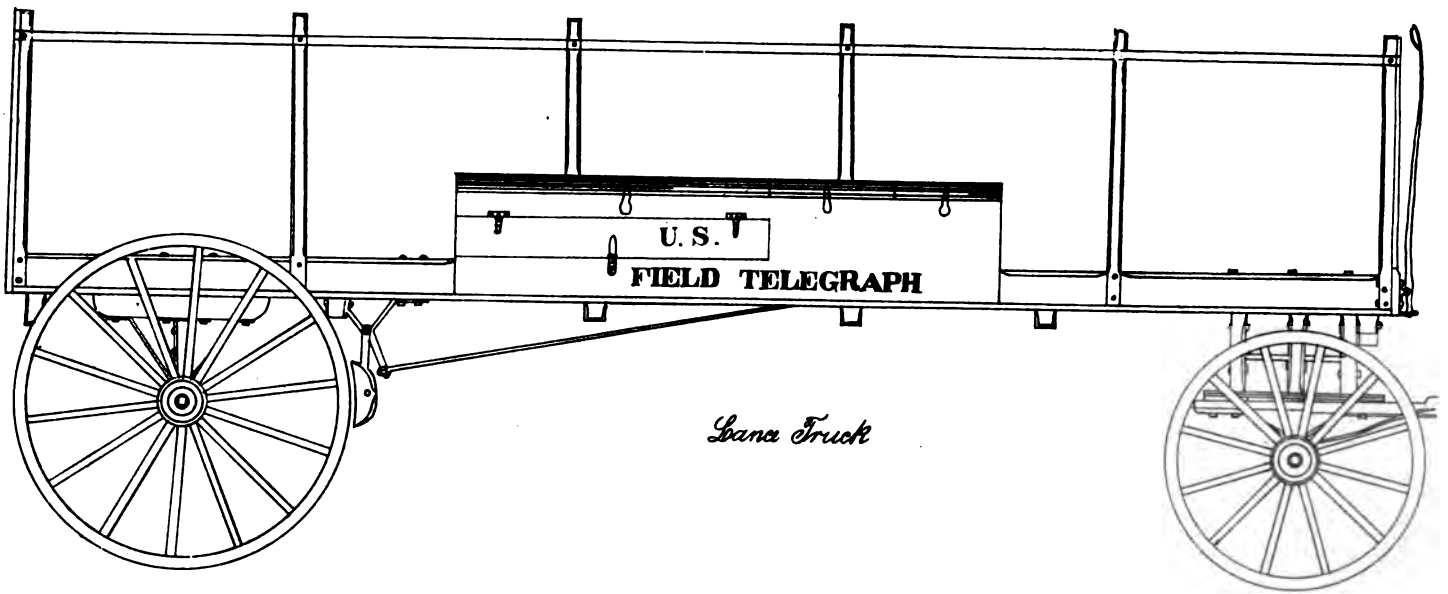
with the main battery. The point in its side movement, drawing a fine imaginary spiral line as the cylinder revolved, passed over the entire surface of the zinc plate, the current flowing through the transmitter when the zinc and needle-points were in contact, but being interrupted whenever the insulating surface of shellac was reached. When the former took place, that is, when the metallic point and zinc were in contact, the current passing to ground through the sending instrument, no flow of electricity reached the receiving station; when the reverse occurred, that is, when the metallic point came in contact with the insulating surface, a resistance was formed, which threw the current out on the line and through the receiving instrument at the terminal station. This latter instrument was similar to the transmitting one, its cylinder bearing, in place of the zinc plate, a sheet of chemically-prepared paper, the solution in which it had been immersed being decomposed by the electric current as it flowed over the line through the steel point of the receiving instrument and to ground. The decomposition discolored the paper. (See Figure 17.) The movements of the two cylinders and of the pen-points were simultaneous. The isochronous revolutions of the cylinders were secured by electro-magnetic clutches on the revolving shafts that bore the cylinders, each clutch passing the poles of a fixed electro-magnet with every revolution. The magnets therefore acted as speed-regulators worked by a commutated current. In order to obtain a current of tension, small cells of carbon-battery were used.



The size of the transfer blank was 5 by 5 inches. The ordinary speed of the instrument was ninety revolutions per minute. A surface of writing covering 1 by 5 inches was transmitted by sixty revolutions of the cylinder.

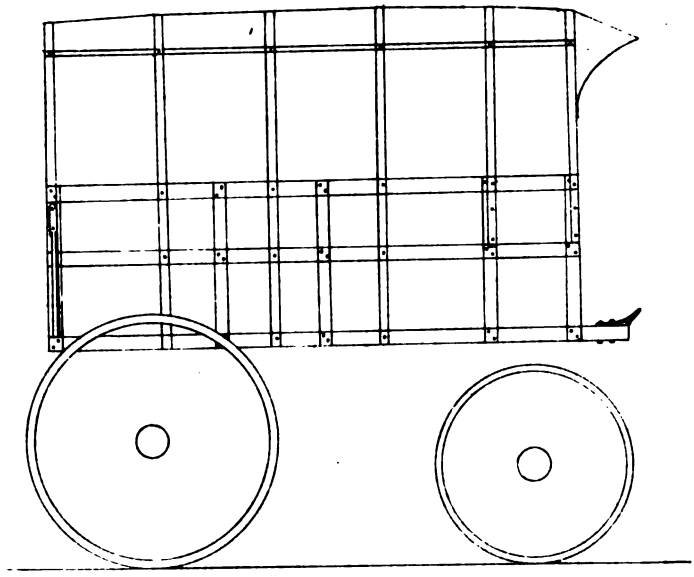
The weather-map having been charted at the central office, the isobaric and isothermal lines were at once reduced in size, transferred to the zinc plate, and telegraphed

Fig. 8

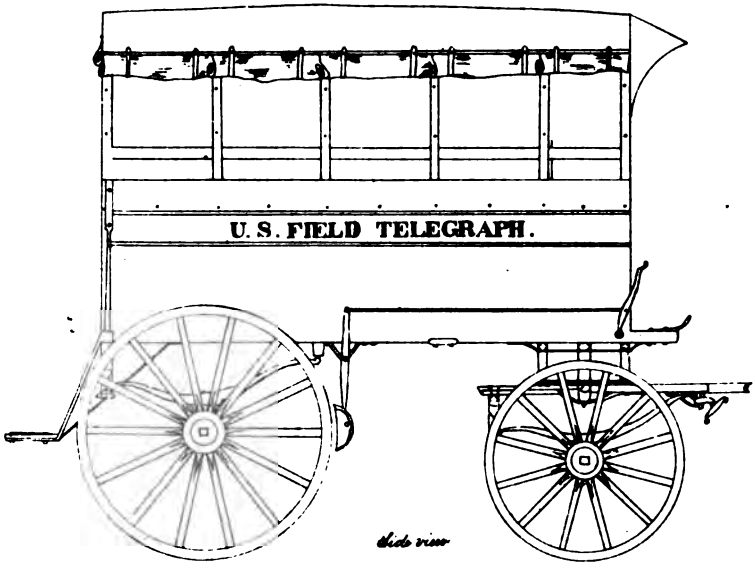


Lana Truck

Fig. 9



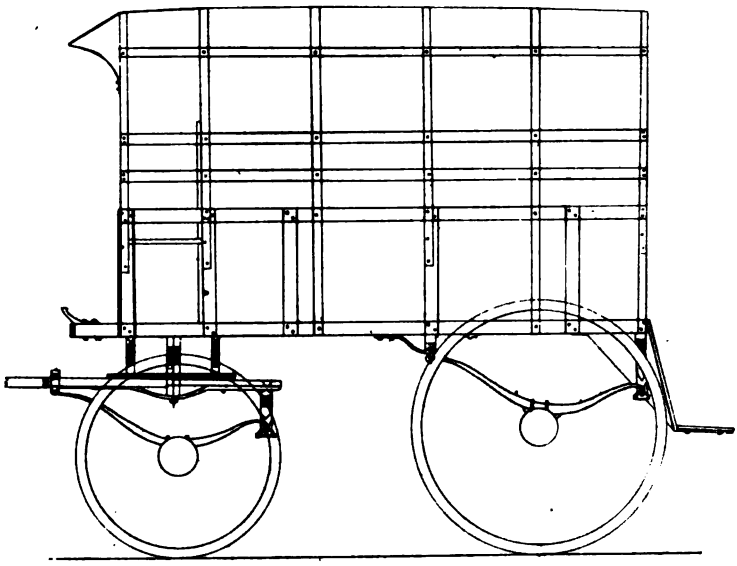
Section



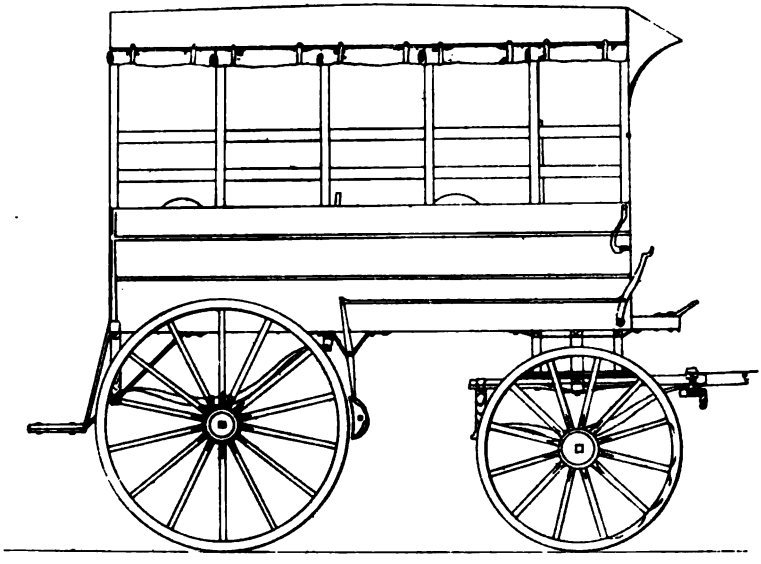
Side view

Battery Wagon

Fig. 10

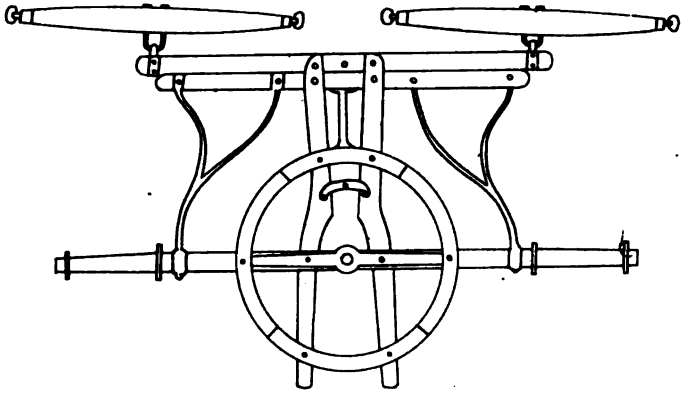


Section

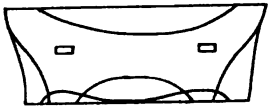


Side view

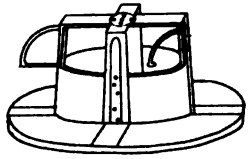
Hire Wagon



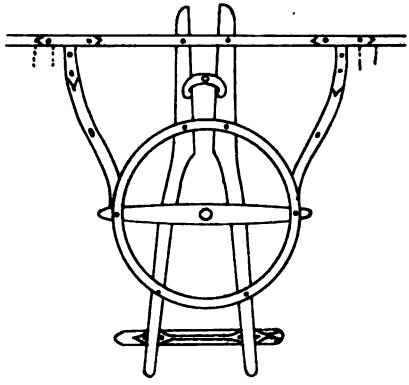
Lance Wagon



Front view of Top bars



Reel for Wire Wagon



Battery and Wire Wagon

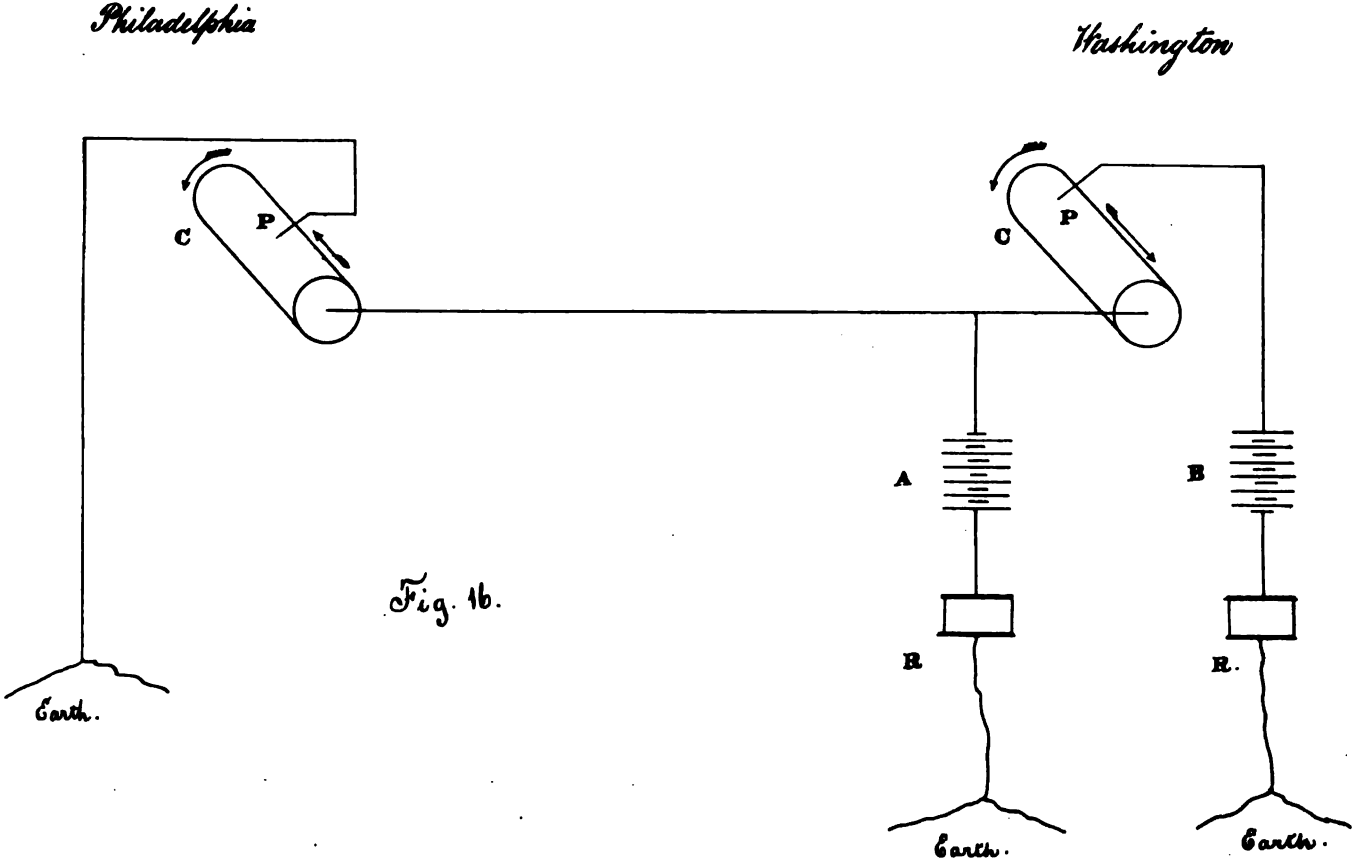


Fig. 16.

Fig. 17

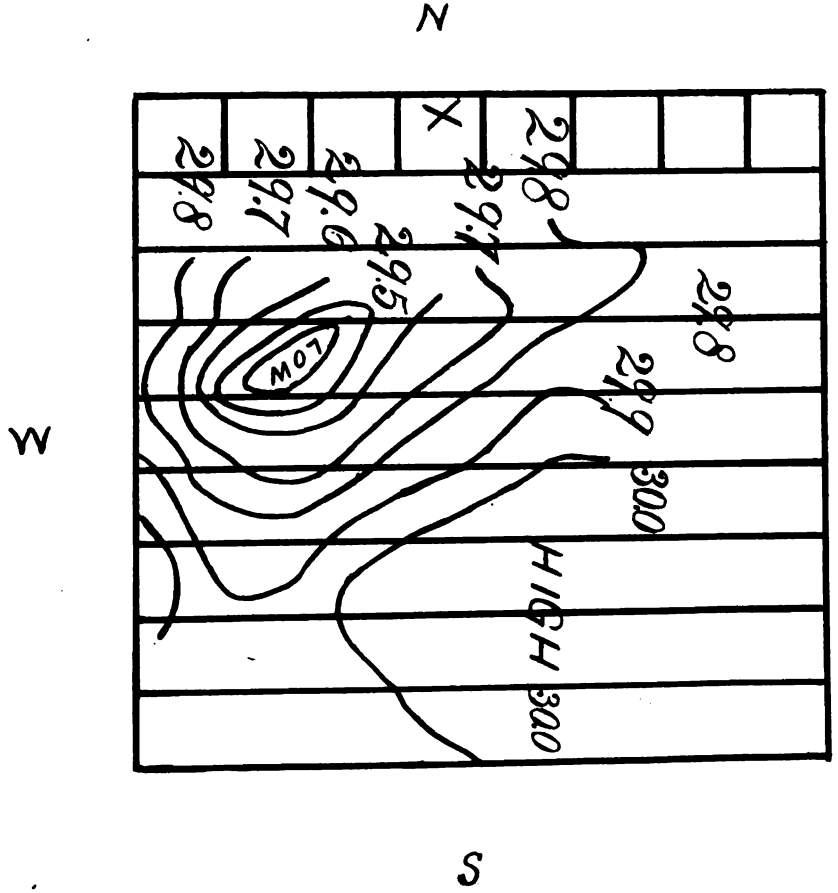
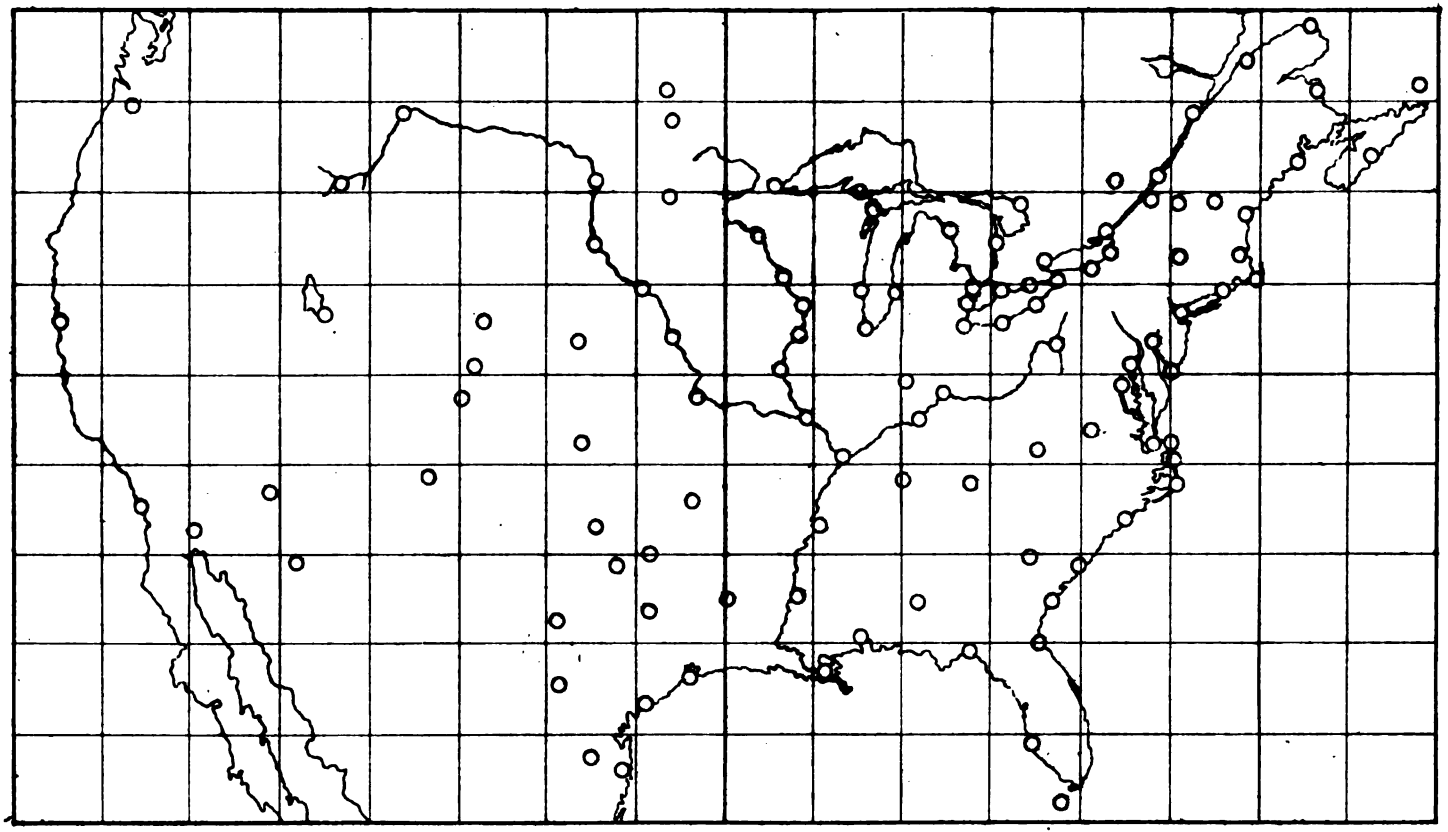
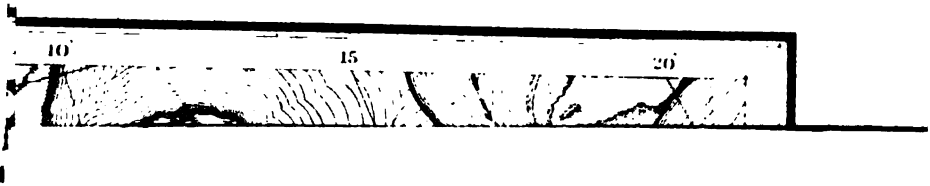


Fig 19.




10
15
20

to the signal-office at the exhibition. There they were rapidly transferred to a base-map of plaster, and turned over to the Herald officials. From the plaster cast the required metal casting was obtained.

By referring to Figure 16, it will be seen that A and B are the batteries; battery A, with negative pole to the line, doing marking on Philadelphia cylinder; battery B, with positive pole to the pen (P), neutralizing in the line the charge of battery A. R R are artificial lines or rheostats, exceeding in resistance the resistance of the line-wire. The object of the resistances is to throw both batteries into the line by preventing them from short-circuiting. Battery A may be said to be always in the line; but, as long as the pen bears on the zinc plate around the cylinder, its action is neutralized by battery B. As soon, however, as the pen touches a line of writing (shellac, an insulating substance), battery B can no longer get into the line, and the pen of the receiver, supplied by the current from A, makes a mark on the chemically-prepared paper on its cylinder. The arrows indicate the directions in which the pens and cylinders move. It will be observed that the receiving-pen at Philadelphia works in a direction opposite to the pen of the transmitter. The original message being reversed upon the zinc plate, it becomes necessary to reverse the action of the Philadelphia pen in order to bring out the *fac-simile* as it should be.

Figure 17 shows one of the two isobarometric sheets as received at the centennial office on the 2d November, 1876, by means of the *fac-simile* instrument. Figures 18 and 19 are the base-maps used for laying off the lines (isobars and isothermal lines) upon the plaster cast referred to above, for the Herald, and also for the official map printed at the exhibition. A copy of the map of November 2, 1876, will be found with this report. By connecting the broken lines on the *fac-simile* sheet, a system of squares is formed, which facilitates the transfer to sheet No. 19.

68. *Field telegraph train, United States Army.*—Organization for an Army corps: A train consists of one battery-wagon, four wire-wagons, four lance-trucks. It will be divided into four sections, each commanded by a lieutenant, the train being commanded by a captain. Each section will consist of one wire-wagon, one lance-truck.

69. *The battery-wagon* is the central or headquarters office, from which four lines may be worked; contains four tables attached to the sides by hinges, one table in each corner of the wagon, and four camp-stools. The batteries, in sections or cases of six cells, are supported by brackets underneath the tables, each bracket supporting two sections. The instruments, when not in use, are carried in a box underneath the driver's seat, together with a supply of stationery, of battery-materials, pliers, &c. A stove is placed in the center of the floor and secured against displacement. The wagon is mounted on platform-springs, turns in its own length, is covered with canvas, is entered by a door at the rear, and is drawn by two horses. (Fig. 9.)

70. *The wire-wagon* is of the same general form as the battery-wagon. An instrument-table is attached to the front end; a single section of battery underneath the table; a camp-stool for operator; a wire-reel seated in a socket in the center of the floor, near the hind end; a hand-bearer secured at the top of the wagon by straps; ten coils of wire (one mile in each) secured to the sides of the wagon. Pliers, files, connectors, instruments, &c., are carried in the box underneath the driver's seat. (Fig. 10.)

71. *The lance-truck* is a wagon without springs, of length sufficient to carry lances, and of strength sufficient to sustain the weight of from three hundred to five hundred lances, and all the line-tools and insulators for ten miles of line. The lances are stowed compactly in the middle of the wagon or truck. The insulators and tools are contained in boxes arranged for the purpose on either side of the wagon (external). (Fig. 8.)

The arrangement of sections allows independent action for each section. Thus a full train may erect lines radiating in four directions from the battery-wagon; or the four sections, the second commencing to reel out its wire when the first has finished, may extend a single line forty miles long or more, having offices at the termini and at three intermediate points, equi-distant from each other. Additional instruments being furnished, intermediate offices other than the regular ones can be opened whenever necessary. The force required to work the whole train is five commissioned officers and one hundred and seventy-four men. Each section (wire-wagon and lance-truck) requires one lieutenant and forty enlisted men, distributed as follows: One lieutenant in charge of section; one director and two markers, whose duty it is to indicate the route of the line of wire to be erected; one surveyor, who follows along the line indicated by the markers and points out the places where the lances are to be erected; three pin-men, the first and second of whom accompany the surveyor and place marking-pins at the points indicated by him; the third pin-man gathers the pins as the line is erected; thirteen bar-men (one being a non-commissioned officer, and in charge), who, armed with crowbars, make holes large enough to receive the lances at the places marked by the pins; two wire-men, who have charge of the wire when reeling out and reeling up; three operators, who accompany the wire-wagon; thirteen lance-men (one a non-commissioned officer, in charge), two of whom ride on the lance-truck, and, attaching spikes and insulators to the lances, pass out a lance at each point indi-

cated by a marking-pin; the remaining eleven follow the wire-wagon and erect the line on the lances; one driver for the lance-truck; one driver for the wire-wagon.

The force required for the battery-wagon providing for lines will be one driver, twelve operators, and one battery-man. The duty of the latter is to take charge of the batteries and other material contained in the battery-wagon.

The messages are received by sound. The instrument used is the "box-sounder," and also what is known as the Caton instrument, six inches long and two and a half inches in width and height. The alphabet used in the field-telegraph of the Signal Service is the "general service code" of the Army and Navy.

The materials for a line of field-telegraph (by which is meant a line to be used in the presence of an enemy, and for the purpose of placing the commanding officer of a force in constant communication with all parts of his line), differ from those of permanent lines chiefly in point of size and capability of being quickly erected and put into use, and as quickly removed when the occasion for the line no longer exists. These materials must be, therefore, such as can be transported with the troops, handled by enlisted men, and, when in line, worked by enlisted men or officers.

The artificial supports must be of such size and weight as may be transported, and, at the same time, have length sufficient to carry the wire above the reach of mounted men or wagons, and strength enough to endure such handling as, under the circumstances, they would be likely to receive, as well as to bear the weight and strain of the line-wire. To meet these requirements they must be made of a material at once light and elastic, and the timber best adapted seems to be the spruce or cypress, either of which, when well seasoned, fulfills very nearly these conditions. The size may vary within certain limits, but that adopted in the field-telegraph trains of the United States Army is seventeen feet long, two and one-half inches diameter at the butt, and one and one-half inches diameter at the top, the butt tapering to a blunt point, and the top secured by a sheet-iron ferrule three inches in length.

72. Such a lance of cypress weighs about eleven pounds, and of spruce a trifle less. A field-line should be supported by forty such lances to each mile of wire, but in emergency, or upon favorable ground, this number may be reduced to thirty-five or even thirty without serious difficulty resulting. (Fig. 14.)

73. The insulators are made of what is known as "ebonite," a prepared form of caoutchouc, cap-shaped, and armed with a gimlet-pointed screw by which they are fastened to the lance or to natural supports, such as trees, houses, &c. The ebonite caps have either a cleft in which the wire rests, or a curved clamp, around the arms of which a wire is passed. The swinging insulator is also in use. (Figures 11, 12, 13.) Wire for field-telegraphs must be light, flexible, and strong enough to bear a tension which will reduce the deflection or "sag" between lances 70 yards apart, of two feet. Iron is the only material which answers the purpose at moderate cost, and an iron wire drawn from charcoal-rods to No. 15 American gauge has been adopted for use by the United States. A mile of this wire, joined up and the joints soldered, makes a coil 18 inches in diameter inside, 4 inches in height and 3 in thickness, and weiging but seventy-five pounds. A supply of insulated wire or cable is also carried with each wire-wagon and with the battery-wagon.

The tools for the erection of a field-line (which constitute, with the materials for the line, the outfit of the train) are: marking-pins by which the points of support are indicated; axes and hatchets, to cut away shrubs or branches of trees, or to affix insulators to natural supports; crowbars to make holes in the earth in which to set the lances; bars, fitted for cutting through frozen ground; climbers, to enable the men engaged in the work to ascend trees, when necessary, for the purpose of affixing insulators thereto or to trim away branches; reels, for the delivery and recovery (uncoiling and recoiling) of the wire; pliers to be used in making connections; files and screw-connectors, which are to be used for making connections between the coils (mile lengths) of wire in reeling out, and generally, where connections are to be frequently made and broken, to avoid loss of time and waste of wire.

74. The marking-pins are of iron wire, one-eighth inch in diameter and 15 inches long, pointed at one end and having a loop or handle at the other, painted of some bright color, and fitted with a small pennon of bright-colored cloth, so as to be conspicuous objects, and are used to mark the places where lances are to be erected by being thrust into the earth at such points, or the natural supports to which insulators should be affixed by the same methods.

It is scarcely necessary to describe axes or hatchets, except, perhaps, to say that the latter should have a hammer-poll with which to drive a spike. But the efficiency of the line may depend on their use, which is mainly to cut down all shrubs growing near the line-wire, to trim off such as come, or might be thrown by the wind, in contact with the line-wire.

75. *Crowbars*, with which to make seats for the lances, are cylindrical iron bars, 4½ feet long, 1¼ inches in diameter for 2 feet from the point, and 1 inch in diameter for the rest of their length, and pointed so as to penetrate the earth easily. Such a bar weighs

Fig. 11.

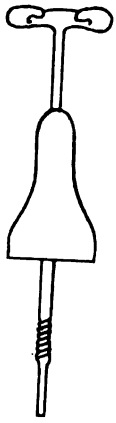


Fig. 14.

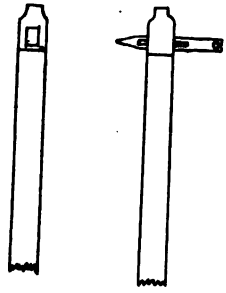
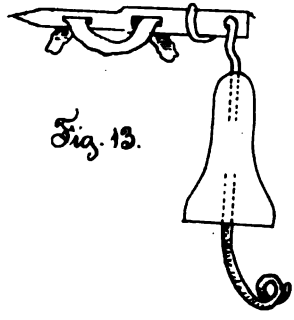


Fig. 12.





Fig. 13.



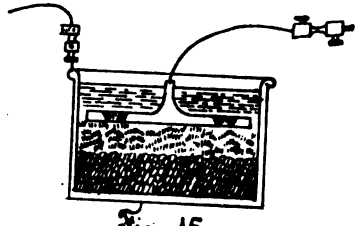


Fig. 15.

15 pounds. These (and all the iron used in the work) should be zinc-coated (galvanized).

76. *Ice-bars* are of the same general form and dimensions as the crowbars, but have a wide chisel-shaped point or blade, and are used for cutting through frozen ground, to facilitate the work of setting the lances.

77. *Climbers*, to enable the men engaged in erecting a line to ascend trees to affix insulators and attach the wire, are of steel, with leathern straps, and weigh about four pounds the pair.

78. *Reels for field use* are, in general form, like those for permanent lines, but are lighter, and are provided with arms attached to the uprights, which are laid flush with the face of the uprights, when reeling out wire, and secured at right angles thereto when reeling, in order to confine the wire and give the coil its proper shape. Each one has a handle affixed to the extremity of one of the upper cross-arms, by which it is turned when reeling up the wire. The reel is seated in the wire-wagon, but may be carried by men over ground impracticable for the wagons in the hand-bearer, one of which should accompany each reel.

79. *The battery* is a sulphate of copper battery. It consists of a vessel made of sheet-lead, in the bottom of which is placed three pounds of sulphate of copper. This is covered with a layer of sawdust one or two inches thick, upon which a zinc plate rests. The vessel is then filled with water. This battery will give a strong and uniform current for a period of from three to six months, without any attention whatever, care being taken to keep the cells filled with water. Each battery-box contains six small-size cells. (Fig. 15.)

In the United States Signal Service a regular form of field-telegraph drill has been adopted. The school of instruction is located at Fort Whipple, Va., two miles distant from the city of Washington, D. C.

F. C. GRUGAN,
First Lieutenant Second Cavalry, Acting Signal-Officer.

PAPER 41.

WAR DEPARTMENT, OFFICE OF THE CHIEF SIGNAL-OFFICER,
DIVISION OF TELEGRAMS AND REPORTS
FOR THE BENEFIT OF COMMERCE AND AGRICULTURE,
Washington, D. C., June 14, 1877.

SERGEANT: The Chief Signal-Officer directs that in carrying out your instructions to collect information relative to the origin, movement and effect of the recent tornado at Mount Carmel, in the State of Illinois, you will use all due diligence consistent with a thorough investigation of the subject. As it will be necessary for you to visit many of the localities lying in the path of the storm, and as transportation is only furnished you to Mount Carmel, your actual expenses for transportation beyond that point will be refunded to you on your return, and you will therefore keep an itemized account of such expenditures for the information of the office.

In pursuing your inquiries you will pay especial attention to the points named in the following memorandum, keeping full notes of all particulars in order that you may make a full report in writing to the Chief Signal-Officer, after your return to this office. Should you be in doubt at any time what course to pursue, you are authorized to telegraph to the Chief Signal-Officer for instructions, but in this and all other matters involving expenditure of money the most rigid economy must be practiced.

MEMORANDUM.

Items to be especially noted.

1st. The exact minutes at which destructive winds or hail-storms occurred throughout the State during that day, in order that the consecutive march of the storms may be traced and their connection with each other understood.

2d. The topography of the ground, that it may be understood what determines the formation of the gaps in the path of the tornado.

3d. The collection of data showing the tracks of the numerous tornadoes that yearly pass over the State, so far as such collection can be made without interfering with or delaying other duties.

4th. Determination of the dimensions of the black cloud marking the storm-center, by means of corresponding observations from opposite sides of the path.

5th. Evidences of the existence of either up or down currents, and determination of their force by means of measurements of the materials elevated or depressed.

6th. Determination of the force required to drive splinters of wood, pieces of iron, stones, and grains of sand into trees and other places where they were found imbedded.

7th. Determination of the extent of the area of destructive winds as compared with the area of the central cloud.

8th. Determination of the time, in seconds, occupied by the destructive portion of the tornado in passing over a given station.

9th. Determination of the distance on either side of the center at which sensible winds were felt, together with the direction of these winds.

10th. Determination of the temperature, humidity, and barometric pressure just before, during, and just after the passage of the destructive blast.

11th. Determination of the connection, both as to time and place, between the wind-storm and the attending rain and hail.

12th. By measurements, drawings, and photographs it should be sought to obtain definite rather than general information, and in this, as in many other respects, the report of Sergeant Mackintosh in 1873 and your own report in 1875 may serve as models.

13th. Especial examination of the mean directions in which the different layers of trees or other objects prostrated by the storm lie.

14th. Especial examinations in this regard at the points at which the tornado has left the earth, and at those at which it has returned to it.

15th. Where two tornadoes were co-existent, a scrupulous examination of the intermediate region, to determine the distance from each at which its influence was preponderating.

Very respectfully,

CHAS. E. KILBOURNE,
First Lieutenant, Second United States Artillery,
Acting Signal-Officer and Assistant.

Sergeant HENRY CALVER,
Signal Service, U. S. A., Washington, D. C.

WAR DEPARTMENT, OFFICE OF THE CHIEF SIGNAL-OFFICER,
DIVISION OF TELEGRAMS AND REPORTS FOR THE
BENEFIT OF COMMERCE AND AGRICULTURE,
Washington, D. C., July 27, 1877.

GENERAL: Having fulfilled the instructions received with Special Orders No. 72, Office of the Chief Signal-Officer, June 14, 1877, I have the honor herewith to transmit my report on the tornado at Mount Carmel, Illinois, June 4th last.

Hoping that the facts collected may prove of value, as well as of interest,

I am, yours, very respectfully,

HENRY CALVER,
Sergeant, Signal Service, U. S. A.

To the CHIEF SIGNAL-OFFICER, U. S. A.,
Washington, D. C.

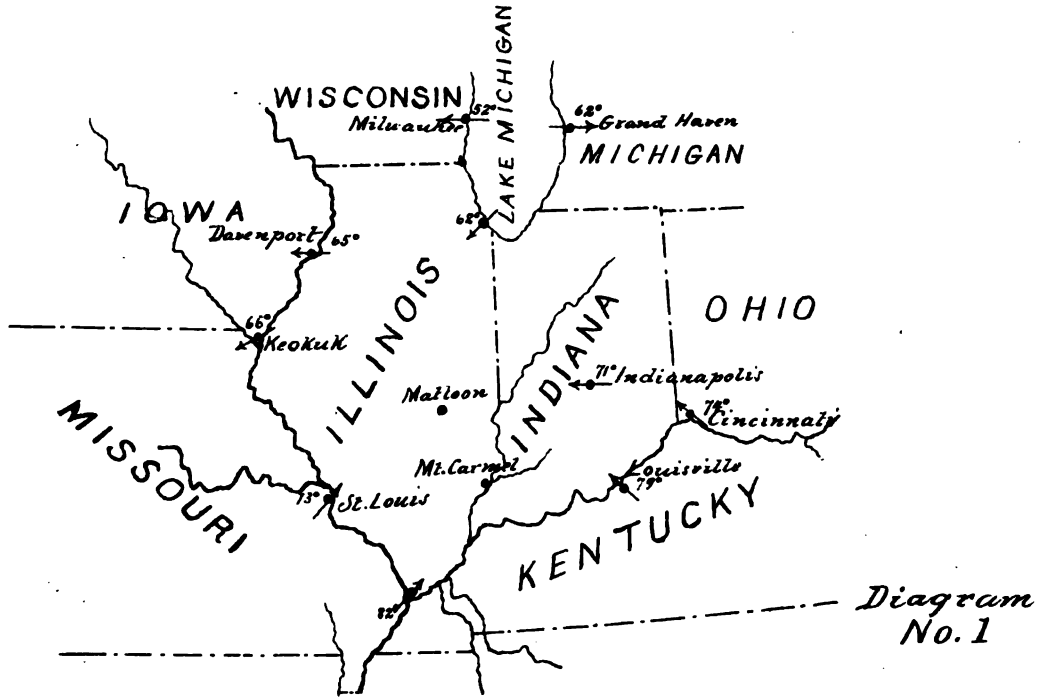
The tornado at Mount Carmel, Illinois, June 4, 1877.

GENERAL ATMOSPHERIC CONDITIONS.

A glance at the general atmospheric conditions on the day of the occurrence of this disastrous tornado, as well as for a few days previous, could hardly fail being of interest here.

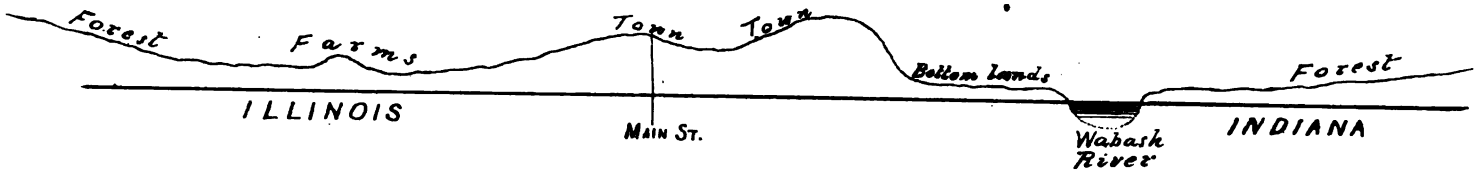
On the Signal Service weather maps for June 1 there was charted a well-defined area of low barometer, its center lying north of Minnesota, apparently near the fiftieth parallel north latitude. This depression moved eastward on this parallel during the 2d and 3d, reaching the Saint Lawrence Valley on the latter day. This disturbance was felt far to the southward of its central depression. On the 1st nearly two inches of rain fell at Saint Louis, and over an inch on the evening of the 2d at the same place, while lighter rains were reported from a majority of the stations in the Northwest, Ohio Valley, and Lake region during the 1st, 2d, and 3d.

The 7.35 a. m. map of the 4th locates this barometric depression in the Lower Saint Lawrence Valley; and while the pressure in the Upper Mississippi and Ohio Valleys had now risen nearly or quite to its normal height, a second area of low barometer was developing on the plains of Nebraska and Kansas, and to this second depression, although its center continued far to the westward during the day, the Mount Carmel tornado may, I think, be properly attributed, as the barometer fell rapidly during the



Temperatures and Directions of Wind at Signal Service stations in Illinois and adjacent states, at 4:35 P.M. [Washington time] June 4th 1877

Diagram
No. 3



Profile of Path of the Tornado

4th in the Lower Missouri, Central Mississippi, and Ohio Valleys. At 4.35 p. m., the area of low barometer was much better defined than in the morning, as the observations, taken by Washington time, show. This was a few minutes after the occurrence of the tornado, and local storms were frequent over the entire country, extending from Kansas eastward to Kentucky and Western Ohio.

At Dodge City, Kansas, a gale from the southwest of 48 miles per hour occurred during the afternoon, and at the time of the 4.35 p. m. observation was still blowing at the rate of 36 miles per hour. The reports from Illinois and contiguous States also show highly contrasted temperatures at this time, as a glance at the accompanying map, diagram No. 1, will show. Thus we find the temperature at Cairo, 82°; Louisville, 79°; Saint Louis, 73°; Indianapolis, 71°; Chicago, 62°; Keokuk, 66°; and Milwaukee, 50°. In connection with these strongly-contrasted temperatures, the map shows opposing southwesterly and northeasterly winds, whose line of meeting, at least in the upper regions of the atmosphere, must have been in Southern Illinois.

For nearly or quite a month preceding this time, the rain-fall in the Missouri, Central Mississippi, and Ohio Valleys had been very excessive. The atmosphere was, therefore, overloaded with moisture, and showers fell with great frequency not only for several days previous to the tornado, but for three weeks afterward, culminating in a remarkable series of severe storms on the 25th and 26th from Kansas to Ohio.

The tornadoes in Georgia and the Carolinas on the 20th of March, 1875, and also those in Iowa and Illinois on the 22d of May, 1873, were, like the Mount Carmel tornado, and the subsequent severe storms in the Ohio Valley and adjacent country, preceded by a period extending over several weeks of excessive rain-fall.

To sum up, it may then be said that the general conditions which appear favorable for the development of tornadoes are: 1st, a long period of excessive rain-fall; 2d, an unusually low or rapidly falling barometer; 3d, the meeting of opposing winds with highly contrasted temperatures. This last condition most frequently occurs just after the passage of the center of the barometric depression, although such was not the case in this instance.

TOPOGRAPHICAL.

The country surrounding Mount Carmel is gently rolling and is partially covered with the original forest. The town is situated on rising ground, some sixty to eighty feet above the Wabash River. The elevation on which the town is built terminates abruptly in a steep bluff, below which the bottom-lands, covered with luxurious verdure, stretch away to the river, half a mile or so distant. (See diagram No. 3.) Across the river in Indiana lies a dense forest which extends for miles on the level bottoms of the Wabash and White Rivers.

The town contains about 2,500 inhabitants, the court-house of Wabash County, several churches, banks, and other public buildings. It lies twenty-five miles southwest of Vincennes, on the Vincennes and Cairo Railroad.

FORMATION AND GENERAL DESCRIPTION OF THE TORNADO.

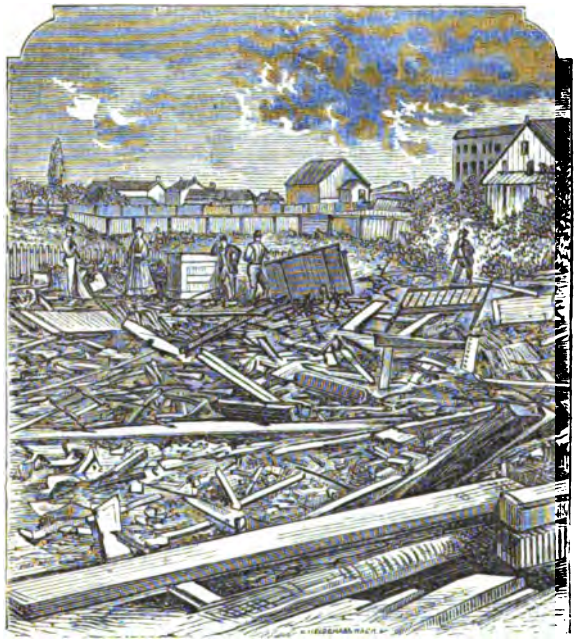
Although its destructive effects, so far as I could ascertain, were confined to the immediate vicinity of Mount Carmel, yet it is probable that the incipient formation of the tornado took place at some distance west or southwestward. I was informed that a storm-cloud passed over Albion, eighteen miles west-southwest of Mount Carmel. Its height above the earth was estimated at a thousand feet, and it was said to have been greatly agitated, as though by hurricane winds. Another cloud, of similar aspect, passed a few miles north of Grayville, which lies about twenty miles south southwest of Mount Carmel. The time of the passage of these two clouds was but a little while previous to the occurrence of the tornado. Some damage was reported from a point nearly thirty miles southwest of Mount Carmel, but this very probably resulted from the more general and quite severe thunder-storm which occurred later in the afternoon.

The first intimation which the citizens of Mount Carmel received of the approach of the tornado was the gathering of threatening clouds in the west about 4.30 p. m. Suddenly, two heavy clouds, of a black or dark-blue color above and dun-color beneath or on the sides, apparently disconnected themselves from the general mass, one moving from the northwest and the other from the southwest. These two converging clouds formed a junction about two miles west of the town.

At the moment of meeting, a column of steam-like cloud shot upward, while at the same time the lower and darker part of the column darted as suddenly downward to the earth. The cloud now quickly assumed the appearance of a water-spout or an inverted funnel, and its rapid gyrations were distinctly visible from the town, toward which the destroyer was moving with great velocity. The first damage done was in a heavy piece of timber, about one and a half miles west of the town. The energy displayed was comparatively slight at first, as only a few trees were uprooted or broken but with its advance the destruction became greater. From the manner in which only the tops of many trees were broken where the tornado first struck, it is quite evident that it swooped downward in its progress like an immense bird of prey. Before reach,

ing the town it made two upward leaps, the first short, the other for nearly half a mile, striking the earth the last time in the western outskirts of the town. Its passage was attended by a deafening roar and an almost twilight darkness. So rapid had been its approach that the terrified inhabitants had hardly time for a glance at the whirling funnel before they were enveloped by it. Its transit through the town, a distance of nearly three-quarters of a mile, could hardly have occupied more than half a minute, and may have been less, while the duration of the destructive blast at any one given point did not exceed eight or ten seconds.

The above general description of the tornado is what I could gather from the accounts of many persons who were in or near it. Of course the estimates of the time occupied in its duration or passage differed very widely, but from the most reliable information, furnished by persons who could give an exact account of what they did during the approach and passage of the tornado, I am inclined to adhere to the above estimates. To persons overcome with terror the time in many instances seemed very much longer.



Plates 1, 2, and 5 will give a general idea of the condition of the town after the occurrence of the tornado.

Charles Ridgeway, station agent and telegraph-operator, one of the very few persons whose point of observation commanded a view of the tornado for any considerable distance, gave me a description in substance as follows:

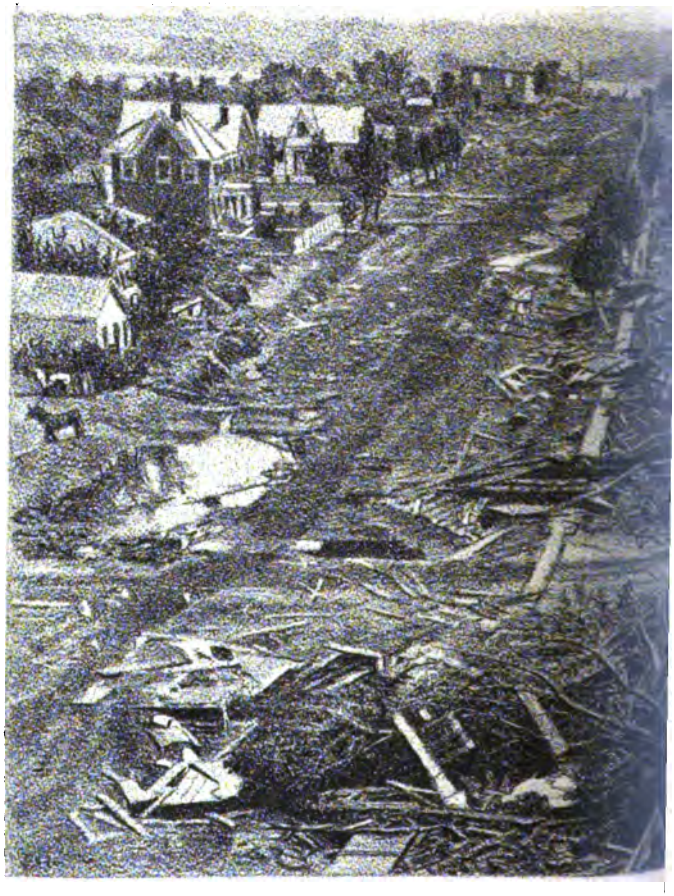
Saw the meeting of the two clouds some distance west of the town and the immediate formation of the dark, funnel-shaped cloud, which seemed to dart suddenly downward with a rapid, whirling motion. Watched its progress through the town and across the river into Indiana. Could see broken trees and the *debris* of buildings whirling in the cloud. No visible electricity was manifested, but the telegraph-wires showed that the atmosphere was highly charged. Was obliged to disconnect the instruments, but notwithstanding this precaution the room was filled with a bluish, sulphurous smoke. The air seemed perfectly calm during the passage of the tornado, which seemed in view for several minutes, but a sudden rush of air from the west followed it at a short interval. A few scattering hail-stones, nearly as large as hen's eggs, fell as the cloud, with its deafening roar, passed, and torrents of rain fell soon afterward.

Mr. Ridgeway's point of observation was about a quarter of a mile north of the tornado track.

Judge T. J. Shannon's residence is located on a slight elevation, some distance west of the depot, and about half a mile north of the tornado-track. Mrs. Shannon's statement, kindly furnished me in writing, is as follows:

"I was watching the approaching storm, when I saw two heavy clouds, one coming from the southwest and the other from the northwest. They appeared to form a junction about two miles west of the town, and at the same time I heard a loud roaring, and thought a long train of cars was coming at full speed. I soon discovered that the noise proceeded from a very singular-looking object, whirling at a rapid rate, with limbs of trees, pieces of boards, and timbers flying around in it. The cyclone did not appear to be more than 50 feet in diameter at the bottom, widening to 100 or 150 at the top. It was very nearly the shape of a funnel, and apparently not over 150 feet high.

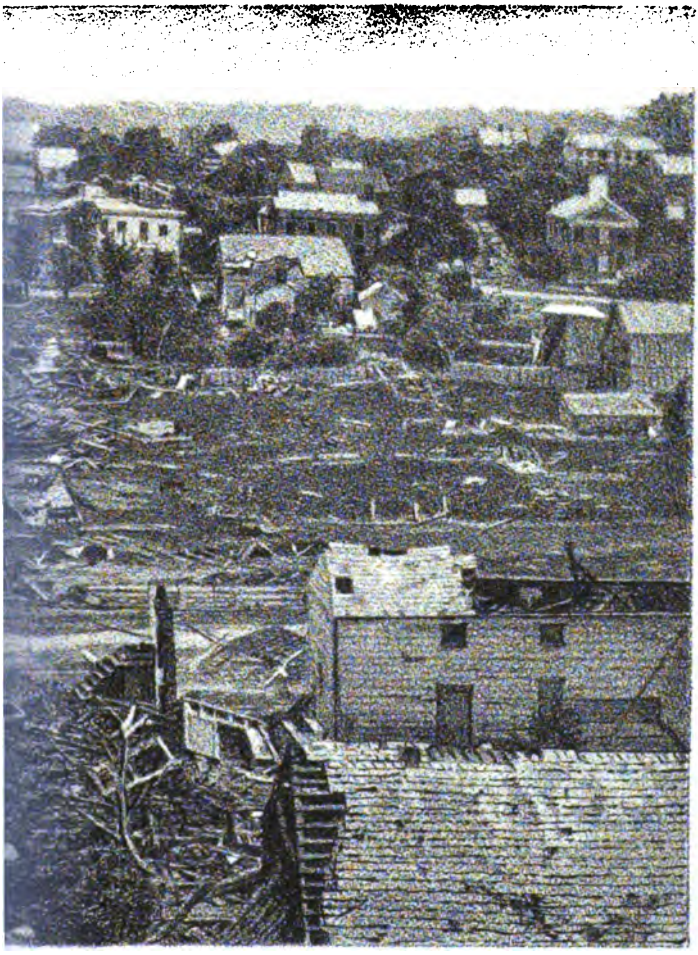
"Its motion was rotary, from east to west, whirling around toward the north. After it first struck the ground it bounded, leaving the earth for a short distance, missing two houses in its track. Reaching the town, it followed Fourth street from one end to the other. When it struck the main portion of the town, it appeared to move up and down; but that may have been owing to the undulating surface. The cloud also



Track of Mt.

Fourth St. looking east from

Plate II.



el Tornado.

hodist Church near Main St.

seemed to sway from side to side. It took up objects from either side, and, in discharging them from the top, threw them in all directions. The cloud was shaded in light and dark streaks, much like black smoke and steam." * * *

Other persons who observed the tornado from a distance stated that they could distinctly see various objects whirling in the black cloud. Some hapless buzzards, caught in the vortex, were unable to escape.

A good illustration of the force with which objects were thrown outward by the centrifugal force generated by the rapid gyrations of the tornado was seen at the house of the Rev. Joseph Harris. This dwelling is located on the north side of Fourth street, about a square and a half east of Main. The tornado made a slight bend toward the south at this point. The houses on the south side of the street were totally destroyed, and bricks and other objects were hurled with great force northward against the buildings, somewhat damaged, but left standing, on the opposite side of the street. A brick, moving at an angle of fifteen or twenty degrees with the horizon, entered Mr. Harris's house through the weather-boarding, lath and plastering, crossed two rooms, a distance of 27 feet, and lodged in the rear wall, without breaking even the corners from the brick. From the large and nearly circular aperture through which the brick entered, I concluded that it must have whirled rapidly in its transit. So great was its velocity, that the laths were cut quite smoothly, without cracking the adjoining plastering, and a picture, hanging within an inch or two, was entirely undisturbed. Many smaller fragments of bricks came into the house through the walls or windows, by one of which the carpet was cut as though by a knife. Mr. Harris saw the approaching tornado through the window, and had hardly time to get his wife and children down into the cellar, the entrance of which was conveniently near, before the tornado had come and gone. He estimated the time of its duration as hardly more than five seconds, and thought that it must have passed through the town in considerably less than half a minute.

Persons who witnessed the destruction of the large and substantially-built stores at the corners of Fourth and Main streets said that they seemed literally to melt down in the fury of the storm very much as a piece of tissue-paper disappears in a hot fire, so quickly were they destroyed.

Lewis Gott saw the tornado strike his new house, his point of observation being one square north. As he described it, the house appeared to go up bodily and plunge into the cloud. Only a very small portion of it was ever afterward seen to be recognized. I examined the place where it stood and found the earth quite bare; not even a sill remained; and the site of Mr. Phillips's house, on Fourth street, west of Main, presented a similar spectacle.

The effects of the backward whirl on the north side of the track were plainly to be seen on Main street, near Fourth. The cupola of the court-house, which stood on the northeast corner of the two streets, was thrown northwestward nearly across the street, taking with it a bell weighing 590 pounds. The lower story of the front or west side of the court-house remained standing, while on the east side the walls were thrown down nearly to the ground, indicating that most of the destruction must have been wrought by the easterly winds. Two large wooden stores on the west side of Main street, in the northern edge of the tornado-track, were also moved some 6 or 7 feet westward without having been seriously damaged, while adjoining them a substantially-built brick block, with 13-inch walls, was leveled nearly to the ground.

Although many small objects were thrown outward by the whirl of the tornado, yet the general tendency of trees and prostrated buildings was inward toward the center of the track, this effect being more noticeable, however, on its southern than on its northern side. At Philip Stein's place, in the southern edge of the track, a fine orchard was prostrated or uprooted, the tops of the trees lying almost uniformly toward the northeast.

A remarkable circumstance occurred here, very strongly indicating the discharge of powerful electric currents from the ground. A stable, resting on heavy round blocks, was overthrown toward the northeast. The blocks, which were about 16 inches in diameter and 14 inches in length, were embedded nearly their entire length in the ground, and at one corner the supporting-block rested on a second block, the bottom of which must have been nearly or quite 2 feet below the surface of the soil. These superincumbent blocks were shot entirely out of the ground, the lower one lying a foot or two distant from its former bed, and the upper one carried away no one knew whither.

The surrounding soil, to the depth of several inches and a radius from the blocks of more than a foot, was also shot away. I was inclined to discredit these facts, and questioned Mr. Stein closely regarding them, particularly as to the existence of the second underlying block, but his repeated statements, corroborated by other witnesses, left me no alternative but to accept them. The holes and surrounding hollows, at that time partially filled with dirt, were shown me, as well as the blocks on which the stable had rested.

From the accompanying profile of the track (see Diagram No. 3), it will be seen that the tornado passed over a well-marked hollow before reaching the bluff, which de-

scends quite precipitously to the bottom-lands bordering the river. In this hollow the destruction was as complete as on the higher ground, and, on reaching the edge of the bluff, the tornado apparently plunged madly downward, as trees were uprooted or broken close under the brow of the hill. Across the bottom-lands its course was but slightly marked, save by scattered fragments of boards and timbers, as there was nothing but a few fences and an occasional tree in its path.

I heard various stories about the water being thrown out of the Wabash River so that the bottom was visible, but could find no eye-witnesses of this fact. Although that a water-spout was formed was quite probable, still I saw no evidence of it at the time of my visit.

Across the river, in the forest on the Indiana side, the tornado displayed an apparently renewed energy. Huge trees, the monarchs of the forests for centuries, were uprooted or twisted off and thrown in every direction, partially masking the effects of the whirl, which, however, were plainly to be seen by a more careful examination.

I followed the track through the forest for about four miles. At a distance of two miles from the Wabash I found most of the trees thrown down toward the east, indicating that the whirl must have been mostly above the surface of the ground, and that the destruction was largely effected by the winds following in its rear. The track here had widened to some 300 yards, with a corresponding decrease of energy, while two miles farther the tornado had nearly lost its original character, being still more spread out, with very little damage to the timber. I was told that the storm crossed the White River a little farther on; but, as I could not learn of any serious damage, I concluded that it had assumed the character of a more general wind-storm, and that as a tornado it had quite lost its identity.

LENGTH AND WIDTH OF THE TRACK.

The entire length of the path of destruction is about 7 miles. Its width varies at different points. What may be termed the track of total destruction, or that portion of the path of the storm in which its full fury was displayed, was from 75 to 125 yards in width, while on either side of this track to the distance of from 50 to 100 yards, many houses were unroofed or otherwise somewhat damaged, and trees twisted or broken.

COURSE OF THE TORNADO.

The general direction pursued by the tornado was from west-southwest to east-northeast. There were, however, some slight variations in its course. For a few hundred yards after first striking the earth it traveled almost directly northeast, next changed its course for a short distance to east or east-southeast; again to northeast; and then, before reaching the town, to east-northeast, in which direction it continued throughout with the exception of one slight detour in the town, as shown in Diagram No. 2.

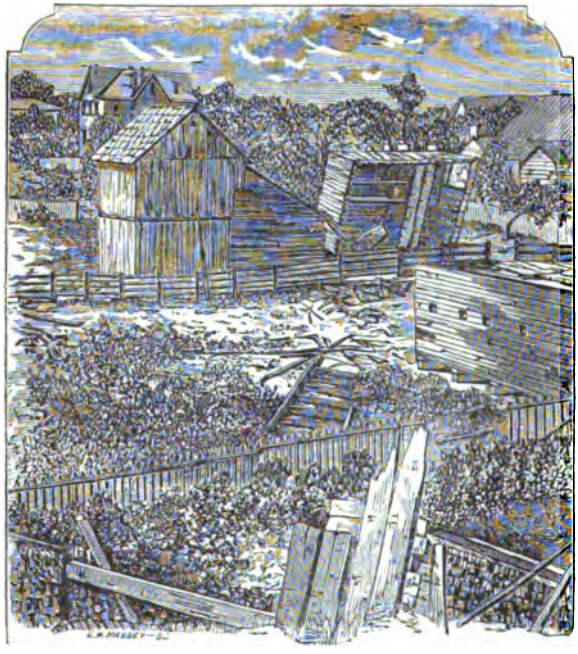
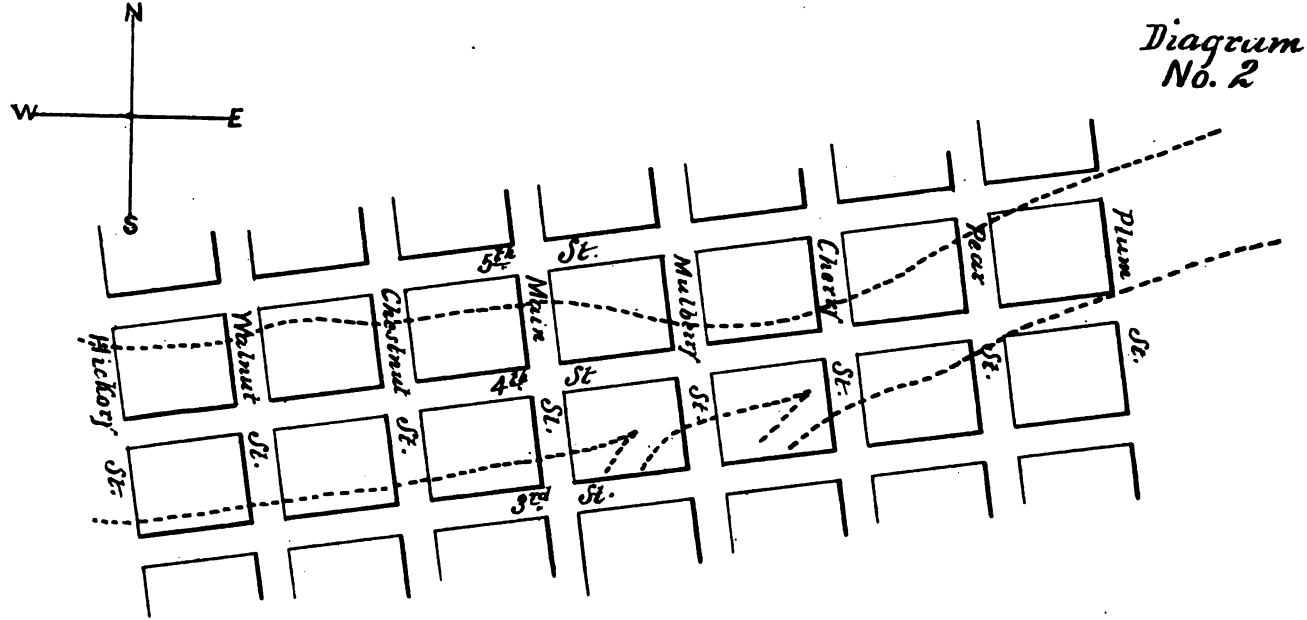


Plate 3.

Many persons saw, shooting out from the main column, smaller jets of what appeared like puffs of steam projecting from above and being again drawn into the general vortex below. These were mostly confined to the southern side of the tornado, and the tracks of these offshoots or spurs were plainly to be seen east of Main street. (See Diagram No. 2.) They joined the main track at an angle of about 45°, running northeastward. One of these spurs overturned trees and fences, leaving buildings standing a few yards west uninjured. The other struck the northern end of the Presbyterian church,

Diagram
No. 2



Main Track of Tornado through Mt. Carmel

demolishing all but the south wall, which was left standing; carried off the upper half of a large barn and overturned a shed, leaving a high and much-exposed corn-house about fifteen feet west of the overturned shed quite uninjured.

APPEARANCE AND SIZE OF CLOUD.

Nearly all witnesses with whom I conversed agreed that the tornado-cloud was of a black or dark-blue color, with streaks of what appeared at times like whitish steam, and at other moments like muddy water, giving a sort of dun-color to the sides and lower portion of the cloud.

This appearance could hardly have been due to dust raised by it, as the ground was at the time soaked by the heavy rains that had fallen for several days previous, and a light shower had fallen shortly before the occurrence of the tornado. The central cloud was funnel-shaped, like an immense water-spout, with the lighter clouds at times whirling round it and commingling their contortions with the darker cloud. As it approached the town, the diameter of the base of the black cloud, to those directly in front, appeared to be about one hundred feet, or, as many asserted, "it just filled Fourth street," which was one hundred feet wide. This would make the dark cloud marking the storm-center about one-third the width of the track of destruction, a proportion coinciding very nearly to the same phenomenon in the Georgia tornadoes. To estimate the height of the column is very much more difficult, there being such wide discrepancies in the statements of different observers on this point. Very few persons obtained good views from positions much removed to either side, and those in or very near the line of the storm were unable to judge of its distance, its approach being so extremely rapid. As Mrs. Shannon's point of observation was nearly or quite half a mile from the track, her estimates both of the diameter and height of the cloud were probably much too small. Taking a mean of the estimates of a large number of witnesses, from whom I obtained their angle of observation when possible, I should estimate the height of the column to have been between 300 and 500 feet, probably not much less than the latter.

VELOCITY OF THE WINDS.

I found it quite impossible to collect any data on which to base calculations that would give satisfactory results as to the velocities of the winds. In the central portion of the track, where the greatest force was manifested, buildings were not only entirely destroyed, but in many instances literally broken to fragments, and trees were torn from the ground, hurled long distances, and broken to pieces or stripped of their smaller branches. It was only in the outskirts of the path of the destroyer that buildings were moved and left standing. I append a few instances: Story and a half house, 40 by 40 feet, corner of Fourth and Cherry streets, moved 5 feet east and 1 foot south. Story and a half house, 18 by 35 feet, corner Fourth and Pear streets, moved 12 feet north. Two-story house, 25 by 30 feet, on Fourth street, near Pear, moved 15 feet north and 12 feet east. Frame building on Main street, near Fourth, moved five feet westward; only the end, with 216 square feet of surface, was exposed to the wind; estimated weight of building, 18,000 pounds. Frame building adjoining the above, with 380 square feet of exposed surface and estimated weight of 34,000 pounds, moved seven feet westward. Adding one-third for static friction, the horizontal pressure necessary to move the structure would be about 106 pounds to the square foot in the former instance and 118 pounds in the latter, corresponding to wind-velocities of 145 and 156 miles per hour, respectively. These, however, are but minimum velocities, as the examples were in the outer edge of the whirl. I found near the center of the track a piece of oak timber that had been driven nearly 8 inches into the body of an apple-tree, and another piece of oak timber, one inch thick, two and a half inches wide, and ten feet long, that, flying like an arrow, had been shot through a small apple-tree limb hardly more than two inches in diameter, two feet or more in length of the improvised shaft having passed through the narrow target. Of course so small an object as the little branch could only have been pierced by the clumsy projectile when thrown at an exceedingly high velocity, possibly equaling that of a minie rifle-ball. These two mementoes were both secured and forwarded to the office here.

PROGRESSIVE VELOCITY OF THE TORNADO.

The length of the track being so short, it is difficult to calculate this element with any degree of certainty. It must, however, have been very great, as the terrified inhabitants of the doomed town, when warned by the frightful roar of the approach of the tornado, had hardly more than time for a hasty glance at the whirling column before they were enveloped by it. The Georgia tornadoes in 1875 I found traveled much more rapidly during the first part of their careers than they did subsequently, after passing into South Carolina; and as the Mount Carmel tornado was fresh in its start, a high velocity may, I think, be attributed to it. Many estimated its rate of progress at over 100 miles per hour, which is probably very much too high. Assuming,

as facts seem to indicate, that the area of storm-winds was circular, with an extreme radius of 150 yards, and that the duration of these winds at a given point was ten seconds, the progressive velocity of the tornado would be about 37½ miles per hour, or somewhat more than half a mile per minute.

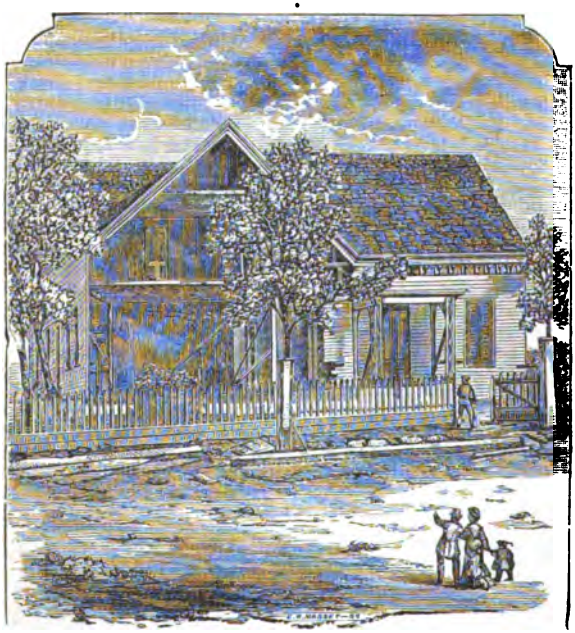
DIRECTION OF THE WHIRL.

This was clearly indicated in many places, and was from east to west by way of north, and from west to east by way of south, or contrary to watch-hands, in accordance with the general law of storms in the northern hemisphere. I found no objects on the southern side of the track which had been thrown westward, while on the northern side many were met with. The cupola and bell of the court-house, before referred to, may be mentioned here as instances of the westward movement of objects, as also may the frame buildings described under the head of wind-velocities. Trees in the north side of the track were in several instances found lying westward, with other trees, apparently prostrated later, lying in different directions above. (See Diagrams Nos. 4 and 5.) The testimony of many eye-witnesses was also confirmatory of this direction of rotation.

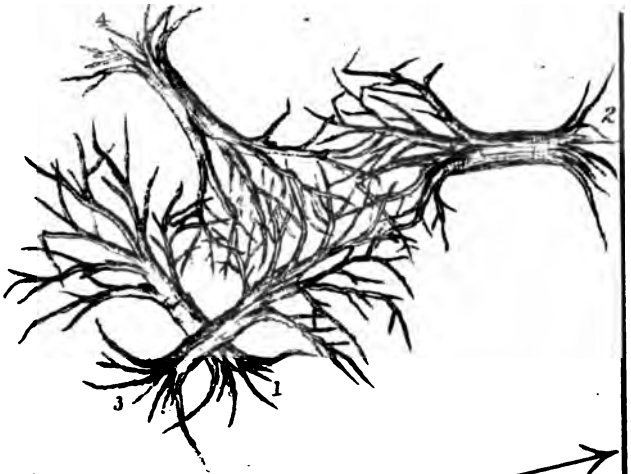
ELECTRICITY.

Although there was at the time a general thunder-storm approaching from the west, yet I could not learn that any thunder or lightning attended the passage of the tornado, nor could I find any one who witnessed a fiery appearance in the cloud, "as of bright dancing flames," as has been stated in some newspaper accounts. That there was abundant electricity in the tornado is quite probable. This is strongly indicated by the electric manifestations at the telegraph office in the depot during the approach and passage of the tornado. If electricity is developed in tornadoes by friction, it would naturally be more manifest after they had been in active operation for a considerable time, and the fact that this tornado had but just started in its destructive career may account for the non-appearance of the ruddiness or flame-like color described by so many witnesses of the Georgia tornadoes. This fiery appearance was, however, generally more noticeable where the tornadoes had followed the ground for much longer distances than the Mount Carmel tornado had.

Professor Tice, whom I had the pleasure of meeting at Mount Carmel, mentions in his account "the unmistakable evidence of electric action" in the case of a pecan-tree



which stood near the center of the vortex just west of the town. The bark was nearly all stripped from its body and the trunk was somewhat splintered, as he describes, but I attributed these effects to the twisting and bending to which the tree must have been subjected rather than to electric action. The pecan is a tree of remarkable toughness; and I was told that directly after the tornado it presented the appearance of having been bent nearly to the ground by the storm, although at the time of my visit it stood quite erect. I did not observe the scorched appearance of trees in the Wabash bottoms, mentioned by Professor Tice. Many were covered by dead and dry leaves, it is true, but these were only broken ones. If any seared appearance was presented directly after the passage of the tornado, it was hardly to be recognized after two weeks of summer weather, with its showers and sunshine, and I heard no reference to any such phenomena. In Georgia, it was unmistakable, in several instances, immediately after the passage of the tornadoes, the visible effects continuing for several weeks.

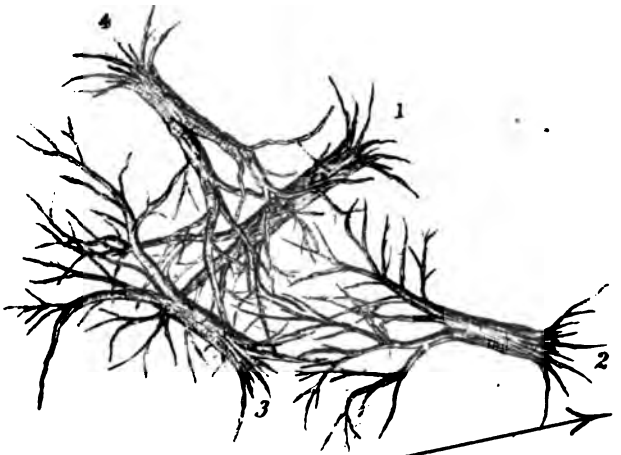


DIRECTION OF TORNADO

N
W
E
S

Group of trees on North side of 4th Street between Chestnut and Main Streets

Diagram No. 4



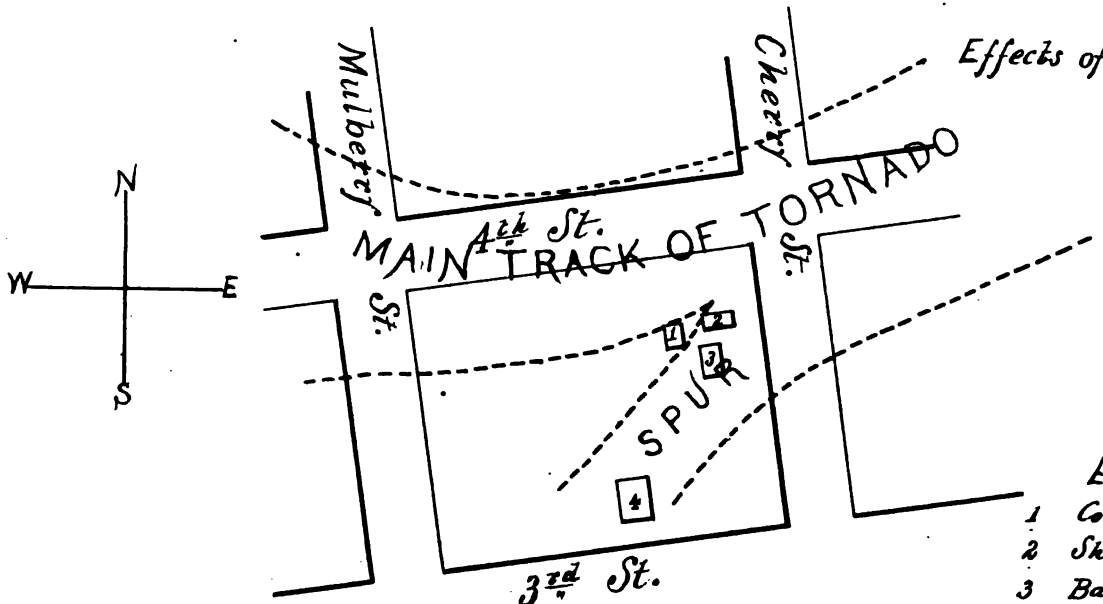
DIRECTION OF TORNADO

N
W
E
S

Group of trees near centre of track on 4th Street between Pear and Cherry Streets

Diagram No. 5

Diagram No. 6 showing Effects of Spur of Tornado.



Explanations

1. Corn-house, uninjured.
2. Shed, overturned.
3. Barn, with upper portion carried away.
4. Presbyterian church [from which man was taken], south wall left standing.

EXPLOSIVE EFFECTS.

These were plainly manifest in several cases. The house of William Seitz, corner of Fourth and Cherry streets, standing in the northern edge of the path of the storm at this point, had the southern end thrown outward toward the center of the track. The house was moved several feet eastward, but was not otherwise seriously damaged. A photograph was made of this building at my request, and will be found in the collection forwarded herewith. (See plate IV.) I also saw two barns on Third street, on the south side of the path of the tornado, with the ends thrown outward toward the south, in those instances away from the center of the storm-track, indicating, I think, a general rarefaction of the immediate surrounding atmosphere. One of the smaller spurs of the tornado shown in Diagram No. 6 passed nearly northward east of the frame warehouse of T. J. Shannon & Co. The sill, with the attached eastern side of the building, was thrown outward one foot toward the east, evidently by the suction of the little vortex or the consequent sudden expansion of the inside air.

DISTANCES TO WHICH OBJECTS WERE CARRIED.

A letter from Mount Carmel was found at Vincennes, Ind., twenty-five miles northeastward. A piece of tin roofing was picked up near Hazleton, Ind., seventeen miles northeastward. The spire, vane, and gilded ball of the Methodist church were found near Decker's Station, Ind., fifteen miles northeastward. A letter from Mount Carmel was carried by the wind to Widner Township, Ind., forty-five miles north-northeastward. A discharge from the military service of the United States belonging to a Mount Carmel man was found near Edwardsport, Ind., nearly fifty miles northeastward, and a letter from Mount Carmel was found near the same place. A large piece of roofing was carried across the Wabash, a distance of over a mile. Several children were carried several hundred yards, without serious injury. Whether they had been bowled along the ground, or taken up bodily, or both, no one could tell. One little girl, I was informed, asserted that she saw the Methodist church steeple go down under her as she passed over, high in air; but I do not credit the statement. I was also told that a paper sack of flour from a demolished store was found nearly five miles distant in Indiana, with no further damage than a small hole in it. This hardly seemed probable, although it might possibly occur if the same air-currents which carried it up continued to operate on it with a gradually decreasing force, thus permitting its gentle descent. The heavy rains which, it was urged, would render the paper too soft to bear the weight of the flour, did not accompany the tornado, although they followed closely after, and the sack might have been safely deposited on the ground before they occurred.

UPWARD AND DOWNWARD CURRENTS.

That powerful upward currents existed throughout with the tornado, there were abundant evidences. Houses, trees, and other heavy objects were taken up bodily and transported long distances. In many of the examples enumerated above, the objects must have attained great heights to have been carried so far from the track of the storm. There were no positive evidences of downward currents. Many instances occurred where timbers or pieces of boards were driven into the ground, but the velocity which they would naturally acquire in their descent from a height of a few hundred feet would be sufficient for this purpose. Being influenced in their descent by horizontal currents, they penetrated the ground at various angles, instead of striking perpendicularly. I will give a few instances. Near the residence of Edward Beall, a piece of scantling was driven nearly three feet into the hard road. Near Philip Stein's house, rafters were driven about four feet into the ground. A piece of board pierced the iron roof of T. J. Shannon & Co.'s warehouse. Two oak sills, twenty-five feet long and 8 by 10 inches in diameter, were driven through a building on Fourth street at an angle of about 30° with the horizon.

HORIZONTAL CURRENTS.

These were everywhere prevalent, as the bricks hurled through Mr. Harris's house, flying fragments of boards, etc., which pierced the sides of buildings in numerous instances, proved.

TEMPERATURE, HUMIDITY, AND BAROMETRIC PRESSURE.

I could not ascertain that any instrumental observations of the temperature, humidity, or barometric pressure of the atmosphere were made at Mount Carmel or in the immediate vicinity at the time of the occurrence of the tornado. From the testimony of many persons, I learned that the afternoon had been oppressively close and warm, indicating an excessively humid condition of the air.

CASUALTIES AND LOSSES.

Sixteen persons lost their lives by the tornado, and nearly one hundred others, I was told, were more or less injured. The destruction of property, from careful estimates, somewhat exceeded $400,000.

THE MATTOON TORNADO.

A small tornado struck Mattoon, Ill., about 4.45 p. m., June 4, or an hour and a quarter after the destruction of Mount Carmel. A violent thunder-storm, said to be the most severe ever experienced in that section, was prevailing at the time, and from this storm the tornado developed, occurring, as nearly as I could ascertain, nearly at the commencement of the thunder-storm and before the latter had attained its full fury. The track of the tornado was hardly more than one hundred feet in width and one mile in length, extending from southwest to northeast through the outskirts of the town. The following particulars were published in the Mattoon Journal of June 5:

"* * * The fury of the storm culminated on the north side of Cemetery street, where the residence of Willis Walkup was turned upside down and rolled into the street, leaving the floor and sleepers on top. Mrs. Walkup, seeing the front door blow open, ran to shut it, and knew nothing more until she came to her senses, with her fingers broken and arms and legs bruised from the flying timbers and furniture. All the smaller buildings about Mr. Heerman's place were flattened. At Windfield Wood's place, across the street south from Heerman's, all of the outhouses and the rear rooms of the residence were flattened out and torn to pieces as if by gunpowder. Scantlings were dashed against the main west wall of the building with such force as to make square holes through it. C. Stewart's cooper-shop, next in the narrow track of the storm, was demolished, and his garden overspread with the ruins of Dr. Edgar's stable. Joe Gibbs's house was moved a few inches on the foundation. Broken trees and demolished flues marked the approach of the storm from the southwest. F. Lawson's and M. Walsh's premises looked like 'clearings,' so much brush was lying around loose. At L. Chapin's, large two-story barns were moved along on the ground several feet. * * * "

After rising from the earth the tornado passed harmlessly over the farm of General J. B. Ayer. General Ayer, who had been watching the tornado, said that as the whirling funnel-shaped column rose from the ground it seemed to divide into several smaller "fingers," which, after retaining a definite form for some little time, gradually dissipated.

OTHER STORMS OF JUNE 4.

In addition to the unwelcome visitors at Mount Carmel and Mattoon, many other severe local storms prevailed on this day in the Northwest, demonstrating that the atmospheric conditions were at the time particularly favorable for their development. At Boonville, Mo., much damage was done to crops by wind and rain. A heavy rain-storm was reported from Saint Joseph, Mo., causing a disastrous overflow of the Missouri River. A violent storm of wind and rain passed over Fredericktown, Mo., in the early part of the day, doing serious damage. Several houses were unroofed, and some blown down.

A water-spout, or cloud-burst, flooded the country near Burlington, Iowa, causing a sudden overflow of Hawkeye Creek, and much damage to machine-shops, founderies, &c.

A severe thunder-storm prevailed at Nashville, Ill., during which two persons were killed.

OTHER TORNADOES.

There have been some newspaper statements to the effect that Mount Carmel was particularly subject to storm visitations, and had twice before been damaged by tornadoes. This assertion is incorrect, although several tornadoes have previously occurred in the vicinity. A tornado passed near Princeton, Ind., ten miles east of Mount Carmel, in February, 1876. I was told that the length of its track was about fifteen miles, and its width from 100 to 200 yards. Its course was from west-southwest to east-northeast. The great tornado of April 13, 1852, passed twenty miles south of Mount Carmel. Its history was admirably written by Mr. John Chappelsmith, of New Harmony, Ind. It traversed a section of country two hundred miles in extent, through portions of Illinois, Indiana, and Kentucky, and was in some places a mile in width. This is the most extensive tornado on record, excepting the remarkable tornadoes of March 20, 1875, in Alabama, Georgia, and the Carolinas.

"CAN THE SIGNAL-SERVICE GIVE WARNING OF TORNADOES?"

I was asked this question by many anxious persons. In answer I replied that the Signal Service stations were, at present, necessarily situated at long distances from each other, and consequently their observations only indicated general atmospheric conditions. From these it could be determined when it was probable that tornadoes or other severe local storms would occur over an extensive region of country. But such storms were usually local in their character and might not extend far, and as it would be quite impossible to say just where they would strike, warnings might do more harm than good. Besides, there were always some elements of uncertainty as to whether

such storms, favorable as the general conditions for their development might be, really would occur at all, as the state of the upper atmosphere, far beyond the reach of observations as now made, was an important factor in their formation. I could, however, give the encouraging assurance that the continued study of the science of meteorology, under the auspices of the Signal Service and other scientific organizations, might ultimately lead to the discovery of laws yet unknown that would materially enlarge the field of usefulness of the present meteorological system.

In this connection, I would offer a suggestion which might prove of practical value in some instances. In examining the history of over fifty tornadoes which have occurred in various portions of the United States during the last eighty years, I observe that the general course of these storms is eastward, with a greater or less deflection toward the north. Out of this number the direction of two is given as northwestward and three traveled a little south of east. Those which were said to have moved northwestward occurred respectively at Charleston, S. C., September 11, 1811, and Woodbridge, Conn., August 13, 1840, and it is possible that there may have been some mistake in the statement regarding this point. Making allowance for these five cases, we find that at least 90 per cent. of the tornadoes, whose history we have, inclined toward the north in traveling eastward. Therefore, a person who saw a tornado approaching from the west might escape if he ran southward, while he would very probably be caught in the vortex of the storm if he ran northward.

DO TORNADOES OCCUR MORE FREQUENTLY NOW THAN FORMERLY?

This question has recently received considerable discussion, but the positive affirmative, in which it is answered by many, will, I think, admit of considerable modification. In an editorial on tornadoes in the Saint Louis Republican for June 6, 1877, I find the following:

"Twenty or twenty-five years ago these storms were of rare occurrence in the Northwest, and seldom did any serious damage to persons or property. Now every year brings us several of them, and the visitation is always attended by disasters of one kind or another, though not often involving the fatal results witnessed at Mount Carmel. When these mysterious and tremendous forces of nature, whose workings have heretofore been almost exclusively confined to the immediate neighborhood of the tropics, advance as far northward as Missouri, Illinois, and even Iowa, it is evident that our climate is undergoing important modifications, the character and extent of which can only be dimly guessed at."

It is possible that the increase of the rain-fall in the Northwest, by the planting of large areas of forests in that formerly comparatively treeless region, may have had a slight tendency to increase the frequency of storms of this character, but not to the extent indicated in the foregoing quotation. There is no data which indicates that these storms were ever confined to the immediate neighborhood of the tropics, but, on the contrary, seem to have occurred, with more or less frequency, in nearly all portions of the United States ever since their settlement. While the country was yet but sparsely populated they were seldom or never heard of far from the locality where they struck, but in these days of railroads and telegraph, every instance of the kind, where loss of life or serious damage to property results, is instantly communicated all over the country.

If the tornado which devastated Mount Carmel had passed a mile farther north or south, it is doubtful whether it would ever have been heard of outside of the immediate vicinity, as it would have missed the town altogether.

PAPER 42.

List of lake disasters during the year ending June 30, 1877.

JULY, 1876.

1.—Propeller Menomonee damaged by collision with schooner Monitor, in river at Milwaukee.

Schooner Eagle Wing damaged by collision with a railroad bridge at Detroit.

John Anderson, seaman on schooner Sunrise, fell from the main-mast stay and was killed.

2.—Schooner H. Folger damaged by collision with schooner B. F. Bruce at Chicago.

3.—Schooner Franz Sigel, in dry-dock at Cleveland, damaged by a gale to the amount of $2,000.

Schooner Florence ashore and a total wreck near Manistee, Lake Michigan. Loss $800.

Bark Canada driven ashore at Port Colborne during a squall.

Scow-schooner capsized and abandoned on Lake Erie.

4.—William Costie, fisherman, drowned off Goderich.
5.—Schooner Hunter damaged by a gale at Buffalo.
Tug Vulcan lost a raft of 2,000,000 feet in a gale on Lake Erie.
Schooners Reed Case, Princess Alexandria, and City of Manitowoc ran on the bank near Algonac.
Patrick Gorman, seaman on steamer Oswego Belle, drowned in Lake Ontario.
Steamer Transit driven ashore and damaged by gale near Hamilton, Lake Ontario.
Schooner Catharine stranded by gale near Hamilton, Ontario.
Schooner Samana split her mainsail and jib-topsails on Lake Ontario.
Fishing-boat Ella, of Oswego, and crew lost on Lake Ontario.
Schooner Sligo lost her bowsprit and jib-boom in a gale off Long Point, Lake Ontario.
Schooner Kate Kelly was driven from her moorings at Oswego by a gale and badly damaged by contact with the docks.
Schooner Saint Catherines stranded in South Bay.
Schooner Eveline sprang a leak, water-logged, and capsized off Girard, Lake Erie.
6.—Barge Ajax water-logged in Niagara River.
7.—Scow D. R. Holt struck a snag at Grand Haven and sank; raised.
Schooner Anna Maria aground on Stag Island, Saint Clair River; released.
Schooner Bohemia damaged by lightning near Whitefish Point.
8.—Propeller ran into and slightly damaged the propeller Empire State in Detroit River.
Propeller Cormorant aground on Revere Point; released.
9.—Propeller Saint Clair totally destroyed by fire on Lake Superior, and twenty-six persons drowned.
Schooner San Jacinto lost her foremast while coming through the straits.
10.—Schooners Major N. H. Ferry, America, W. H. Rounds, and Mineral State damaged by collision at Chicago.
Schooner King Sisters returned to Port Huron leaking.
Propeller Canisteo aground at Marine City.
11.—Propeller Mary Jarecki damaged by fire at Marquette.
12.—Schooner Maggie Dall seriously damaged by a collision with the schooner Guiding Star in Chicago River; amount of damage, $2,500.
Foresail of schooner Leo torn by jib-boom of schooner A. E. Moore at Chicago.
Tug Champion burned on Lake Saint Clair; total loss about $3,500.
14.—Schooner Delos de Wolf damaged by collision with propeller Commodore and Cuba at Chicago.
15.—Barge Tracy J. Bronson and schooner James C. King damaged by collision in the river at Chicago.
17.—Schooner Robert Howlett lost her main-boom in a squall on Lake Michigan.
Scow H. H. Hines was run into and damaged by an unknown vessel while at anchor near Gracy Island.
18.—Schooners Levi Grant and Monterey damaged by collision in harbor at Chicago.
Schooner Edward Blake damaged by collision with a bridge in Welland Canal.
19.—Schooner John Tibbets lost her fore-staysail in a squall.
Propeller Susquehanna ran ashore during a fog near Milwaukee; released. Scow John Bean, jr., and schooners Vermont, Peshtigo, Mary Nall, William Crossthwaite, and Rouse Simmons, had their canvas damaged by a gale on Lake Michigan.
Tug Cora B. damaged by collision at Saginaw.
Schooner H. C. Albright lost some of her canvas in a gale on Lake Huron.
20.—Schooner Surprise broke her center-board on Lake Michigan.
Schooner Carlingford driven ashore on Green Islands during a squall in the Straits.
21.—Propeller Badger State broke her machinery on Lake Huron.
22.—Propeller Sheboygan broke her follower during a gale on Lake Michigan.
Schooner J. Bigler and G. L. Wrenn damaged by collision at Chicago.
Schooner Ida had her mainsail split in a gale on Lake Michigan.
Schooner C. C. Trowbridge damaged by collision with a bridge at Chicago.
Schooner T. S. Skinner broke her fore-gaff in a squall off Chicago.
Schooner Minnie Mueller badly damaged by collision with a bridge at Chicago.
Schooner E. C. Roberts struck a rock and water-logged on Lake Huron.
Schooner E. W. Rathbone ran into by Propeller Mineral Rock on Lake Huron and severely damaged.
Tug Andrews damaged by collision with a bridge at Toledo.
23.—Scow Laurena and schooner Maine and Holmes arrived at Chicago, leaking.
Schooner Bismarck lost her headgear and bowsprit in a collision on Lake Huron.
Schooner Grantham arrived at Chicago damaged by gale on Lake Michigan.
Barge Argonaut and steamer Ben Drake damaged by fire at Chicago.
Propeller Buckeye, steam-barge S. C. Baldwin, and schooner Minnie Mueller damaged by collision at Chicago.
Schooner Sea Lion beached at Saint Joseph, Mich., during a gale.

24.—Barge Michigan lost her rudder at Oswego.
Schooner Narragansett lost her fore-gaff in a gale on Lake Huron.
25.—Schooners C. K. Nims, William Jones, and W. H. Hawkins arrived at Chicago leaking.
Steam-barge H. C. Schnoor aground in Saint Clair River.
Schooners Trio and Mayes damaged by collision at Chicago.
Scow German damaged by collision in Detroit River.
Schooner E. M. Carrington damaged by collision at Cleveland.
26.—Steamer Clara Belle broke her machinery near Northport.
Wrecking tug Crusader ashore at Mackinaw Island; released.
27.—Schooner Ida H. Bloom beached near Manistee during a gale; released.
Propeller A. C. Van Raalte and schooner E. M. Portch damaged by collision in Grand Traverse Bay.
28.—Schooner Ontario arrived at Montreal leaking badly.
Schooner Anna Lyons ran on a pier and sank at Two Rivers, Lake Michigan.
29.—Schooner T. S. Andrews damaged by a collision at Chicago.
Tug J. L. Higgie damaged by collision with schooner Lucind Van Valkenburgh, off Chicago.
Barge Marine City aground on Grassy Island.
Schooner Onward aground on Ballard's Reef, Detroit River.
Tug Parker broke her journal while towing on Lake Saint Clair.
31.—Schooner J. W. Brown had her main-rigging damaged by collision in river at Chicago.
Steam-barge Alma Munro broke her machinery at Port Colbourne.
Steamer Sherman struck a crib near harbor entrance off Sandusky, and stove a hole in her side.

AUGUST, 1876.

1.—Tug Eagle sank in Muskegon Bay.
2.—Propeller City of New Baltimore broke some of her machinery near Saint Clair, on Saint Clair River.
Steam-barge Jarvis Lord damaged by collision at Erie.
Propeller Asia broke her crank-pin at Detroit.
Tug W. B. Castle slightly damaged by fire at Cleveland.
3.—Schooner J. V. Taylor arrived at Chicago with her fore-gaff broken.
Schooner Etna and schooner Mary L. Higgie damaged by collision at Chicago.
Propeller Benton ran aground on Elk Island, Saint Clair River.
4.—Schooner Negaunee damaged by collision in Detroit River.
Schooner Samana lost her foretopmast in a squall on Lake Erie.
Scow William Wellhouse lost her mainsail in a squall on Lake Erie.
5.—Schooner Negaunee damaged by collision in Detroit River during a fog.
6.—Scow William Wellhouse lost some of her rigging in a squall on Lake Erie.
7.—Schooner Nassau badly damaged by collision with a bridge at Chicago.
Schooner Topsy damaged by collision with a bridge at Chicago.
Schooner Mary E. Cook damaged by collision with a pile-driver in river at Chicago.
Propeller Saint Albans damaged by collision with the schooner S. Anderson at Chicago.
Schooner Hans Crocker and propeller Montgomery damaged by collision in river at Chicago.
8.—Brig Lucy J. Clark badly, and schooner Sam. Flint slightly, damaged by fire at Chicago; amount of damage $1,800.
Propeller Cuba ran into and damaged the barge O. J. Hale in the river at Chicago.
9.—Schooner Pride damaged by collision with a bridge at Milwaukee.
Scow Victor, stone laden, sunk at Montreal.
10.—Schooners Mariner and City of Woodstock damaged by collision in river at Chicago.
Schooner C. C. Barnes driven from her moorings at Milwaukee by a gale and slightly injured.
12.—Tug Standard damaged by fire at Cleveland.
Steamer Norsemen broke her machinery off Port Hope.
Schooner Eveline lost her gaff-topsail in a squall on Lake Michigan.
Robert Talky, sailor, fell overboard from steamer Fannie Shriver at Saugatuck and was drowned.
13.—Propeller Colorado ran ashore on Pound Island, Straits of Mackinaw, during a fog; released.
Tug S. S. Coe broke her wheel in Milwaukee Bay.
14.—Schooner Hans Crocker ashore on Haverly's Reef, Lake Michigan; released.
15.—Schooner Carrier damaged by collision at Chicago.
Steamer J. W. Steinhoff broke her wheel on Lake Erie.

16.—Barge Saginaw arrived at Cleveland in a leaky condition.
Tug Oscar Folsom ran on the rocks near Dummy Light at Buffalo; released.
17.—Tug Bradley sank at Detroit.
Scow Surprise lost her foremast in a gale on Lake Michigan.
Propeller Ontario aground at Stay Island; released.
Steam-yacht Rosaline broke her shaft at Put-in Bay.
18.—Steamer Armenia aground near Bath; released.
Tug Cramer broke her wheel on Friday at Towanda.
Scow May Breeze sprang her foretopmast-head on Lake Erie.
19.—Schooner Dan Newhall and scow L. Painter arrived at Milwaukee leaking.
Tug J. J. Hagermann broke her wheel at Milwaukee.
Horace Ames, mate of scow Seabird, fell overboard and was drowned in Saugatuck River, near Lake Michigan.
Schooners Truman Moss and Levi Rairson lost their jib-booms during a squall in the straits.
Steamer Admiral aground at Belleville, Canada; released.
Scow T. S. Skinner damaged by running into a dock at Muskegon.
Schooner Mary Collins lost her flying-jib during a squall in the Straits.
Propeller Manisteer broke her machinery in Portage ship canal.
20.—Schooner Ella Ellinwood arrived at Chicago with her foresail badly torn.
Scow Minnie Corlete lost her jib-boom at Chicago during a gale.
Schooner Mary McRea slightly damaged by striking the breakwater at Chicago during a gale.
Schooner Levi Grant damaged by collision at Chicago.
Schooner Mary Grover sprang a leak, and put into Oak Orchard, in a water-logged condition.
Schooner Mary Ann Leydon broke her jib-boom by collision at Oswego.
Schooner Tranche Montage lost portion of her deck-load in a gale on Lake Ontario.
Propeller Arctic aground in Detroit River; released.
21.—Yacht Sylvia capsized on Lake Michigan and two of her crew, James Brooks and James Day, were drowned.
Schooner Sturgis damaged by collision in the river at Chicago.
Tug Tom Brown broke her valve-stem at Chicago.
Brig Fashion damaged by collision with a bridge at Chicago.
22.—Tug Ferry badly damaged by collision with tug W. L. Ewing at Chicago; amount of damage, $300.
Schooners Robert Campbell and Persia arrived at Chicago leaking.
Schooner Maine lost her jib-topsail by a collision in river at Chicago.
Schooner Laurel, ore laden, sprang a leak and sank off Big Sandy Creek, Lake Ontario.
23.—Steamer J. C. Clark broke her rudder, rudder-post, and shoe in Snikarty River, and was towed to Port Huron for repairs.
24.—Tug Diamond ran upon piles and sank at Chicago; raised.
Schooner Dolphin sprang a leak on Lake Michigan.
25.—Schooners White Oak and E. S. Ryder arrived at Chicago with canvas damaged.
Schooner Adventure put into Buffalo disabled.
Schooners Gladstone and Seabird lost portions of their deck-load on Lake Ontario.
Scow Kane lost a portion of her deck-load on Lake Michigan.
Barge Midnight damaged by collision with propeller Oakland at Bay City.
26.—Schooner Christine Nillson lost her jib-boom by collision with a bridge at Chicago.
Scow S. P. Wilson arrived at Chicago minus her topsail.
Schooner Melvina arrived at Chicago leaking.
Schooner J. O. Moss lost her stay-sail in a squall off Chicago.
Schooner Pathfinder arrived at Chicago minus her main and mizzen topmasts.
Schooner J. W. Porter was damaged by collision at Cleveland.
Schooners H. P. Baldwin, Driver, Beloit, and Metropolis lost portions of their canvas and rigging in a gale on Lake Michigan.
27.—Propeller Skylark broke her valve-stem on Lake Michigan.
Propeller Wenona aground on Grassy Island, Detroit River; released.
Schooner Regulator lost her fore and main sails in a gale on Lake Michigan.
28.—Tug Levi Johnson lost her smoke-stack by collision with a bridge at Milwaukee.
29.—Bark Favorite lost her jib-boom by collision in river at Chicago.
Schooner J. S. Mastin lost her mainsail on Lake Michigan.
Frederick Helmer, deck-hand on propeller Annie L. Craig, drowned in Detroit River.

SEPTEMBER, 1876.

1.—Schooner Berlin sunk at Fairport.
Scow Dan Hayes went ashore at Fairport Harbor, Lake Erie, during a gale.

2.—Schooners San Jacinto and Lake Forrest seriously damaged by collision off Chicago.
Tugs Torrent and Sweepstakes damaged by collision in Detroit River.
3.—Schooner Jane Bell and scow T. S. Skinner have arrived at Chicago minus portions of their rigging.
Schooner Camden arrived at Buffalo leaking.
Schooners A. Rust, George L. Wren, Frank Crawford, Hartford, and Republic damaged by collision at Chicago.
Schooners J. F. Tracy and William Sturgis arrived at Chicago leaking.
Propeller H. E. Paine sprang a leak and sank at Grand Haven.
4.—Steam-barge City of Port Huron foundered on Lake Huron; total loss. Value, $15,000.
Schooner Advance sprang a leak on Lake Michigan during a gale.
Barge Wyoming water-logged at Port Huron.
Barge George Dana sprang a leak and water-logged on Lake Erie during a gale.
5.—Schooner G. R. Roberts lost her jib-top-sail in Milwaukee Bay.
Propeller India ran into and damaged the schooner C. N. Johnson at Chicago.
United States steamer Michigan damaged by collision with schooner American Union at Chicago.
Schooner W. H. Rounds arrived at Chicago minus her foreyard.
Barge John Marks arrived at Chicago in a water-logged condition.
Schooner Dolphin went ashore at Racine during a gale.
Tug Farrar struck a snag and sank in Saint Clair River.
Barge Jessie Finn sprang a leak in Milwaukee Bay, Lake Michigan.
Schooner Daisy driven ashore during a gale at Stony Creek; total loss.
6.—Schooners H. B. Berger and C. S. Davis arrived at Milwaukee minus portions of their deck-loads of lumber; lost in a gale on Lake Michigan.
Barge Windsor, lumber-laden, arrived at Chicago in a water-logged condition.
Schooners Richard Mott, Lincoln Dall, and Black Hawk, and yacht Mamie, arrived at Chicago with damaged rigging, caused by a gale on Lake Michigan.
Schooner American Union lost her jib-boom and foretopmast off Grosse Point, Lake Michigan.
Schooner Mary water-logged on Lake Michigan.
7.—Schooner Harvest-home sprang a leak, water-logged, and sank in Lake Michigan, off Grand Haven.
8.—Scow South Side damaged by collision with a railroad bridge at Milwaukee.
9.—Schooner Whirlwind water-logged during a gale and went ashore at Racine, Wis., Lake Michigan. Total loss.
Schooner A. W. Luckey broke her mainmast on Lake Erie.
10.—Schooner Walhalla put into Sheboygan, Wis., badly damaged in rigging by a gale on Lake Michigan.
Schooner Charley Hibbard lost her main and fore sails and a portion of her deck-load in a gale on Lake Michigan.
Schooner Cornelia sprang a leak on Lake Michigan.
Bark Cecilia ashore at Wheatly Dock, Lake Erie; released.
Schooner Harriet Ross ashore at Wheatly Dock, Lake Erie.
Schooner Northumberland ashore at Wheatly Dock, Lake Erie.
11.—Tug Protection damaged by collision with a bridge at Chicago.
Steam-barge N. Mills disabled on Lake Huron.
Schooner Mocking Bird arrived at Milwaukee minus portions of her rigging lost in a gale on Lake Michigan.
Schooner David Ferguson sprang a leak on Lake Michigan.
Bark Favorite lost some of her rigging in a gale on Lake Michigan.
Schooners William Jones, John Miner, Seabird, and Mariner arrived at Chicago with damaged rigging, caused by a gale on Lake Michigan.
Schooner C. K. Dixon arrived at Chicago leaking.
Propeller Ontonagon water-logged and went ashore at Colchester, Lake Erie.
Schooner Delos de Wolfe arrived at Chicago minus her mainsail.
12.—Bark Arabia damaged by collision at Chicago.
Propeller Holland ran into and badly damaged by the propeller Bertschy at East Saginaw.
Schooner Progress sprang a leak on Lake Michigan.
Schooner S. F. Atwater ashore on Thirty-mile Point, Lake Ontario; released.
13.—Brig Gladiator put into Milwaukee leaking badly.
Schooner John Walters ashore near Eagle Dock, Lake Erie.
Frank Anderson, mate of schooner Cuba, fell overboard at Chicago and was drowned.
Propeller Asia damaged by fire at Detroit.
15.—Schooner G. S. Hazard damaged by collision with railway bridge at East Saginaw. Amount, $1,000.

Schooner Great West damaged by fire at Chicago.
Schooner M. J. Cummings ashore on Snake Island, Lake Ontario.
16.—Schooner Wm. Elgin ran into and badly damaged the schooner S. H. Kimball at Port Huron.
Tug Pioneer sunk at Sault Ste. Marie.
Propeller Georgian sprang a leak in a squall on Lake Erie.
17.—Bark Geo. Thurston beached near Point Edward.
Six fishermen drowned off Erie, Pa., in a gale on Lake Erie.
Schooner City of Chicago aground on Peshtigo Shoals, Green Bay; released.
Steamer D. P. Spear destroyed by fire at Toledo.
Schooner Seabird ashore at South Bay, Lake Ontario; released.
Scow Rough and Ready water-logged and abandoned on Lake Huron.
18.—Schooner Jenny Lind was towed into and damaged the schooner Owasco at Chicago.
Schooner Morning Star lost some of her rigging on Lake Huron.
Schooner Seabird and propeller Annie Craig damaged by collision at Port Huron.
Schooner Richard Mott and A. J. Dury arrived at Chicago with damaged rigging.
Schooner E. P. Royce ashore on Canadian Point au Sable, Lake Huron.
19.—Scow George Irwin damaged by collision with schooner C. S. King at Cleveland.
Schooners Josephine Dresden and Jennie Mullen arrived at Chicago in a leaky condition.
Tug Mystic sunk in the Sault Ste. Marie Canal.
Tug Wadsworth sunk in the Welland Canal.
Barge Katie Brainard aground near East Saginaw.
Barges Crocker and Katie Brainard damaged by collision near East Saginaw.
Schooner C. G. King towed into and damaged the scow George Irwin at Cleveland.
Schooner E. M. Carrington damaged by collision with a bridge at Cleveland.
21.—Schooner Jane C. Woodruff sunk in Welland Canal.
Schooner Journeyman damaged by collision with schooners Schuylkill and Alleghany in Pigeon Bay.
23.—Schooner George B. Sloane struck a rock and sank in harbor at Port Colborne.
Schooners Tri-Color, Maggie Thompson, Clipper City, Norman, Ataunto, Hattie Wells, and tug Johnson damaged by collision at Chicago.
Steam-barge Victoria broke her cylinder-head in Detroit River.
Schooner Geo. B. Sloane struck a rock and sank in Welland Canal.
Martin Vincent, sailor on schooner Senator Blood, drowned at Buffalo.
24.—Schooner Tempest sprang a leak at Chicago.
Tug Jacket broke her wheel at Chicago.
Schooner Magic damaged by collision with a bridge at Chicago.
25.—Schooner Tempest sprang a leak at Chicago.
Propeller D. F. Rose scuttled and sank at Tonawanda to prevent destruction by fire. Loss $10,000.
Schooner H. C. Richards damaged by collision with bridge at Manitowoc.
26.—Schooner C. H. Walker sprang a leak and foundered at mouth of Saint Clair River.
Barge Rio Grande water-logged at Sand Beach Harbor of Refuge.
Schooners Sardand and Leonard Seaton damaged by collision at Port Huron.
Schooner Golden Rule lost her center-board on Lake Michigan.
Schooner G. R. Roberts driven ashore in Big Sister Bay during a gale; total loss.
Schooner J. P. March driven from her moorings and damaged by gale at Cleveland.
Captain Mott, of schooner Anna Robinson, drowned at Milwaukee.
27.—Schooner Nicholson lost her boom on Lake Michigan.
Steam-barge Lady Franklin destroyed by fire at mouth of Detroit River. Loss, $6,000.
Schooner Caroline damaged by collision at Chicago.
Schooner Anna Maria hard aground at foot of Stag Island; released
Schooner Ariadne damaged by gale on Lake Ontario.
Richard Brown jumped overboard and drowned from barge Lady Franklin when on fire.
Schooner British Queen lost her deck-load in a gale on Lake Ontario.
28.—Schooner Great West, scow Felicitous, and barge Venus damaged by collision at Chicago.
Bark Maria Martin and schooners Michelson, Richard Mott, John Miner, D. G. Fort, Lincoln Dall, and Little Belle arrived at Chicago leaking and otherwise damaged by gale on Lake Michigan.
Schooner Kate Kelly driven ashore at Holland, Mich., during a gale.
Propeller Lake Erie ashore on Frazer's Shoals, Saint Lawrence River.
Barge St. Clair arrived at Buffalo in water-logged condition.
29.—Schooner Jessie Phillips towed into Milwaukee in a water-logged condition.
Schooner T. B. Rice water-logged on Lake Huron.

Lumber-barge Mercury water-logged on Lake Michigan and lost her deck-load.
Schooner Queen City damaged by collision with a bridge at Chicago.
30.—Schooner Kearsarge arrived at Chicago in a water-logged condition.
Schooner Iver Lawson and barge C. F. Allen arrived at Chicago leaking.
Schooner Skylark lost her anchor in Detroit River.

OCTOBER, 1876.

1.—Schooner Seabird arrived at Oswego minus her foretopmast.
2.—Schooner Aldebaran ashore near Point au Pellee, Lake Erie.
3.—Schooners Gisme and L. S. Hammond damaged by collision at Chicago.
Schooner Odin ashore in Allison's Bay; released.
Schooner Florida struck a rock in the Welland Canal and sunk.
Schooner J. O. Moss arrived at Chicago minus a portion of her deck-load.
Schooner Imperial arrived at Chicago leaking.
Scow Paxton arrived at Wyandotte minus a portion of her cargo of coal.
Bark Maria Martin lost her maintopmast and some canvas off Wolf River.
Schooner Zack Chandler and C. K. Dixon badly damaged by collision on Lake Saint Clair.
Tug Quayle broke her machinery towing in the river.
4.—Schooner Belle Waldbridge on the reef at North Bay, near Death's Door, Lake Michigan. Released.
Propeller Prussia towed into Port Colborne Harbor in a disabled condition.
Schooner Orient ashore near Dexter, Lake Ontario. Released.
Tug Compound broke her machinery while towing in Buffalo Harbor.
Schooners Nassau and Hoboken arrived at Chicago with damaged rigging.
5.—Schooner Annie Vought lost some of her rigging in the Straits.
James McMannis, sailor on schooner James Couch, washed overboard and drowned on Lake Huron.
Schooner Grace Greenwood beached at Saint Joseph, Mich, during a gale. Total wreck.
Bark Constitution beached during a gale near Whitefish Point, Lake Huron. Total loss.
Schooner Alleghany lost some of her canvas on Lake Michigan.
Schooners Champion and Havana damaged by collision at Chicago.
Schooner Pensaukee ran into and damaged the schooner Jenniebel, at Plum Island.
Schooner Tempest was towed into Manistee, in a water-logged condition and minus her deck-load and some canvas.
Schooner L. L. Lamb aground near Cape Vincent.
Schooner Jane Bell ashore on Plum Island. Released.
6.—Schooner Light Guard ashore on Middle Island, Lake Huron.
Schooner Cataract ashore on Middle Ground, Bay of Quinte. Released.
Steam-barge Trader struck the pier and sunk at South Haven, Lake Michigan.
Schooner Alice B. Norris put into Escanaba, leaking.
Peter Sinclair, mate of schooner Zack Chandler, knocked overboard by boom and drowned at Buffalo.
Tug Alice Getty damaged by fire at Waukegan.
Scow Diamond struck a rock at Colchester Reef, Lake Erie, and sunk. Total loss.
Schooners Elizabeth Jones, Zack Chandler, and Queen City damaged by a gale on Lake Erie.
7.—Barge Mars ashore at Ludington.
Schooner Plymouth beached near Ludington.
Schooner Algerine lost her main boom in a gale on Lake Erie.
Barge Baurer jettisoned 20,000 feet of lumber during a gale on Lake Erie.
Propeller Chauncey Hurlbut arrived at Buffalo, leaking.
8.—Bark J. G. Master and schooners Ella Ellinwood and Albatross arrived at Chicago in a damaged condition.
Schooner Rathbun beached near Southampton, Ontario.
Schooner James D. Sawyer sprung a leak and lost some of her rigging in a gale near the Manitou.
Tug Ormsby burned in Green Bay. Loss $6,000.
9.—Barge Catlin ashore at Ashtabula.
Barge Boscobel ashore at Rond Eau Point.
Schooner Buena Vista arrived at Milwaukee minus her center-board.
Schooners E. R. Blake, J. V. Jones, Stockbridge, and Negaunee arrived at Chicago, damaged.
Schooner J. F. Tracy arrived at Chicago, leaking.
Bark Lottie Wolf sprung a leak in Beaver Harbor.
Scow George Neville sprung a leak and lost some of her canvas on Lake Michigan.

Schooner J. R. Bently ashore in Erie Basin, Buffalo.
Schooner Harvest Queen is ashore near Port Colborne.
William Frazer, captain of schooner Nettie Weaver, was drowned at Tonawanda.
Bark Mocking Bird sprung a leak and sunk in Lake Erie.
Barge Kearsarge beached during a gale near Rond Eau, Lake Erie.
Schooner Wanderer ashore near Manistee. Released.
Schooner Hattie Earl lost her rudder in making Grand Haven Harbor.
Propeller Badger State ran into and damaged Schooner Mary Lydia at Detroit.
Schooners Albatross and Minnie Blakely arrived at Oswego minus portions of their deck-loads and rigging.
Propeller City of Madison sprung a leak and twisted her rudder-stock at Leland.
Schooner Northumberland put into Buffalo badly damaged and minus a portion of her deck-load.
Schooner Mary Ann dismasted in a gale on Lake Ontario.
Scow Hercules beached during a gale near Pine River. Total loss.

10.—Steam-barge Nahant ashore, Waiska Bay.
Schooner Cortez put into Port Colborne in a badly-damaged condition.
Brig E. Cohen and schooner Huron put into Port Colborne leaking, and with damaged canvas.
Schooner Erie Belle near Long Point, dismantled.
Propeller Tioga arrived at Buffalo with damaged steering-apparatus.
Schooners P. B. Locke, Algerine, and Woodruff put into Buffalo, leaking and damaged.
Schooner Frederick in Grand River, Michigan, water-logged.
Schooner Mont Blanc put into Port Colborne minus sails and jibs.
Schooner Typo damaged by collision with City of Madison at South Manitou Island.
Schooner L. M. Guthrie dismasted during a gale on Lake Erie.
Propeller Maggie Hunter foundered in a gale near Oswego. All the crew lost.

11.—Steam-barge Colin Campbell damaged by collision with a barge at Ludington.
Schooner George C. Finney put into Port Colborne with anchors broken.
Steamer Indian ran into and damaged the schooner Columbian at Kingston.

12.—Schooner C. K. Nims ashore at Manitou Island. Released.

13.—Schooner Augusta ashore at Bath, Lake Ontario.
Schooners Ada Medora and Bay State ashore at mouth of Menomonee River, Lake Michigan. Released.
Propeller Empire State ran into and badly damaged the schooner Jane Ralston at Middle Island, Lake Huron.
Schooner William Jones damaged by striking the pier at Michigan City.
Tug Nelson damaged by fire at Chicago.
Steamer Flora broke her shaft on Lake Michigan.
Bark Golden West arrived at Detroit leaking badly.
Tug Prindeville damaged by collision at Chicago.
Scow Leon Diamond sprung a leak and sunk in Lake Erie.

14.—Propeller New York sprung a leak during a gale and sunk in Lake Huron.
Schooner Butcher Boy and barges McGillroa and Garney arrived at Port Huron in a water-logged condition.
Scow Dan Sickles struck the pier and sank at Sheboygan.
Schooner William Crosthwaite sprung a leak on Lake Michigan.
Albert Valleau, seaman on scow Charley Crawford, lost overboard near Point au Barques.
Schooner Our Son ashore on Beaver Island.
Henry Selt, seaman on schooner Lydia, washed overboard and drowned off Kewaunee, Lake Michigan.
Schooner Sarah Jane sprung her masts on Lake Huron.
Schooner Southwest aground in Detroit River.
Schooner Tempest arrived at Chicago leaking.
Schooner Jennie Mullen driven against the pier at Michigan City by a gale and damaged.

15.—Propeller Commodore arrived at Buffalo leaking.
Propeller Dean Richmond ashore on North Manitou Island. Released.
Schooner Kate Winslow lost some of her canvas in a gale on Lake Erie.
Schooner R. B. Campbell capsized off Muskegon, Lake Michigan. Total loss; value $4,000.
Tug City of Alpena ran into and damaged the schooner Mont Blanc on Lake Erie.
Schooners Mary L. Higgin, Jamaica, Sea Gull, and Undine damaged by a gale on Lake Michigan.
Schooner Golden Rule arrived at Chicago in a water-logged condition.

16.—Schooners L. W. Perry, Lincoln Dall, Geo. L. Seaver, San Jacinto, Cape Horn,

Winnie Wing, and Helen Blood arrived at Chicago damaged in rigging, and leaking.
Schooner Alpena sprung a leak on Lake Huron.
Schooner British Queen completely disabled off Cobourg.
Schooner Sea Bird ashore at Port Austin.
17.—Steamer Daniel Ball burned off Bay City; value $15,000. Total loss.
Schooners B. Parsons and Gypsy arrived at Chicago leaking.
Schooners Elvina, Narragansett, and Young America arrived at Detroit badly damaged.
Scow Coaster water-logged at Muskegon.
Schooners Bolivia and Nellie Teresa damaged by gale on Lake Ontario.
19.—Bark Massillon sprung a leak and sank in Saginaw Bay.
Scow Armand dismasted and driven ashore near Thames light-house.
20.—Schooner James Couch lost some of her canvas in a squall on Lake Michigan.
21.—Alexander Mitchell, seaman on schooner Lucerne, knocked overboard and drowned in Detroit River.
23.—Tug John Chassell destroyed by fire at Portage Entry.
Schooners Caroline Marsh, Bermuda, and Great Western lost some of their canvas in a gale on Lake Ontario.
Propeller Oswego Belle damaged by a gale on Lake Ontario.
Schooner Odd-Fellow ashore at Oswego; released.
Schooner John Martin grounded in the Neebish Rapids.
24.—Schooner Northwest sunk in Lake Michigan.
Schooner F. L. Danforth badly damaged by running into schooner Northwest on Lake Michigan.
Schooner E. M. Stanton struck the pier and sank in Kenosha Harbor.
Schooner Maggie Thompson arrived at Chicago in leaky condition.
Schooner William Hunter ashore on Niagara Reef. Total loss.
25.—Schooner Rising Star put into Port Colborne in a damaged condition.
Schooner Two Nellies ran into and damaged the schooner R. C. Crawford at Chicago.
27.—Bark Kate Darley sprung a leak on Lake Michigan.
28.—Schooner David A. Wells sprung a leak on Lake Erie.
Schooner Madora damaged by collision with a bridge while entering Manitowoc Harbor.
29.—Barge W. P. Peck water-logged and sunk in Lake Saint Clair.
30.—Bark Geo. Thurston sprung a leak on Lake Huron.
Schooner J. R. Bently broke her center-board on Lake Michigan.
31.—Steamer Shannon aground near Belleville. Released.

NOVEMBER, 1876.

3.—Scow Rush ashore at Buck Horn, Lake Erie.
4.—Tug Clara damaged by fire at Detroit.
5.—Tug Orient sunk at Buffalo.
Schooners Moonlight and Croathwaite lost portions of their rigging in a gale on Lake Michigan.
6.—Schooner Kate Howard ashore at Saint Joseph, Mich.
Schooners A. J. Rogers, George Murray, Brown, and Clipper City arrived at Chicago in damaged condition.
7.—Steamer John A. Dix damaged by striking the pier at Ludington.
Schooner Mary Battle ashore at Murray Point, Lake Erie.
Four barges of propeller Antelope's tow ashore in Lake Erie.
Schooner Kate Kelly aground in the Rivers.
Sloop Edwards capsized in a gale on Lake Michigan, and one man drowned.
8.—Schooner Surprise arrived at Oswego leaking.
9.—James Coughlin, seaman on schooner City of Chicago, drowned in Thunder Bay, Lake Huron.
12.—Propeller City of Fremont ashore on Stag Island. Released.
12.—Scow Home beached at Racine, Lake Michigan. Total loss.
Propeller Commodore ran into and damaged the schooner Oneonta at Chicago.
Tug Bennett ashore near Saint Helena Island, Straits of Mackinaw; five of her crew smothered by steam.
Barge Ajax sunk in Pigeon Bay.
14.—Bark America lost her jibboom in Chicago Harbor.
Schooner Athenian grounded on Lime Kiln Crossings and sunk. Raised.
Schooner William Home went ashore on Tawas Point, Lake Huron, during a gale. Released.
Propeller Nebraska and schooner Eveline Bates damaged by collision at Port Huron.

15.—Morris Williams, deck-hand on propeller China, fell overboard and was drowned in bay at Erie.
Oscar Olson killed by a fall on schooner Elizabeth Jones, at Buffalo.
16.—William Robbins, sailor on schooner Eliza White, killed by a fall from the rigging at Port Hope.
Propeller Lawrence damaged by collision with propeller Montana at Chicago.
17.—Tug Van Dolsen damaged by collision with tug Satisfaction at Chicago.
18.—Schooners Lotus and Wells Burt slightly damaged by collision in the Straits.
20.—Steamer Col. Phillips burned to the water's edge at Maysville. Loss $20,000.
21.—Schooners E. K. Bruce and Ferguson damaged by collision at Chicago.
22.—Schooner Skylark ashore on Simcoe Island, Lake Ontario. Released. Scow Christie lost all of her upper rigging on Lake Michigan.
Schooner Mary E. Gregory damaged by collision at Chicago.
23.—Propeller Favorite broke her shaft on Lake Michigan.
Pat Boylan, seaman on barge Marquette, drowned at Alpena.
Steam-barge Trader broke her shaft on White Lake.
25.—Schooner Irene went ashore on Braddock Point, Lake Ontario, during a snow-storm.
Steam-barge W. H. Barnum aground at foot of Bois Blanc Island. Released.
26.—Mate of schooner Nett Woodward lost overboard on Lake Ontario.
27.—Schooners Helen Pratt and A. Rust damaged by collision at Chicago.
29.—Schooner Felicitous damaged by collision with a bridge at Chicago.
30.—Schooner Hans Crocker waterlogged and went ashore at Kenosha, Lake Michigan.
Schooner Southwest ran into and damaged the schooner Young America at Cleveland.
Schooner William Crosthwaite damaged by drifting against the schooner Golden West at Saint Joseph's, Mich.
Schooner Winnie Wing lost her deck-load and damaged by a gale on Lake Michigan.
Schooner William B. Ogden lost considerable canvas and rigging in a gale on Lake Erie.
Schooner Lillie Parsons dismasted in a gale on Lake Erie.
Schooners J. F. Joy and Niagara damaged by collision at Chicago.
Schooner A. F. Gale foundered near Fairport, Lake Erie, and entire crew lost.

DECEMBER, 1876.

1.—Propeller Fairbanks aground in Detroit River. Released.
Schooner Theodore Perry towed into Cleveland in damaged condition.
2.—Schooner Hettie Taylor ashore in Eagle Harbor, Green Bay.
Schooner Bay State damaged and sprung a leak by striking the dock at Chicago.
3.—R. Roberts, seaman on schooner Nett Woodward, washed overboard and drowned in Lake Ontario.
6.—Schooner Ida May ashore at Petoskey, Mich.
8.—Propeller Ira Chaffer waterlogged and beached near Chocola, Lake Superior.
Propeller City of Madison ashore at the Manitaus.
Schooner Annie Lyons ashore at South Manitou Island.
12.—Scow S. P. Wilson beached at South Haven, Lake Michigan.
William Menery, seaman on schooner Katie Pringle, knocked overboard and drowned in Georgian Bay.
18.—Tug Welcome cut and damaged by ice in Milwaukee Bay.
Tug T. C. Maxon cut through by the ice in the river at Milwaukee.
Schooner Strife ashore in Lake Erie. Total loss.

NOTE.

20.—Navigation closed for the winter.

JANUARY, 1877.

No disasters this month.
Navigation suspended.

FEBRUARY, 1877.

No disasters this month.
Navigation suspended.

MARCH, 1877.

No disasters this month.
Navigation suspended.

APRIL, 1877.

4.—Steamers Ruby and Lake Breeze aground in the rivers.
5.—Steamer Norfolk burned to the water's edge at Kingston. Loss, $7,000.
8.—Scow Banner ashore in Black Lack during a gale.
9.—J. P. De Couder's pier, near Holland, Mich., carried away by the ice. Loss, $4,000.

11.—Tug Newell Avery burned to the water's edge and sank in White Lake.
12.—Propeller Truesdell damaged by collision with a schooner on Lake Michigan.
16.—Scow E. Masters cut down by the ice and sunk at Sodus.
18.—Schooner Albatross sprung a leak and waterlogged on Lake Michigan during a gale.
Schooner Mary White lost her deck-load in a gale on Lake Michigan.
19.—Schooner S. V. R. Watson on Point au Pelle, Lake Erie.
20.—Scow Milton broke her center-board on Lake Michigan.
21.—Tug Twilight sunk at Holland, Mich.
Schooner Kate Hinchman sunk in Ogden's Canal, Chicago.
22.—Schooner Hungarian arrived at Muskegon, Mich., in a leaky condition.
23.—Schooner C. North sprung a leak at Chicago.
24.—Schooner Peshtigo sprung a leak at Chicago.
26.—Schooner Anna Thorne lost some of her canvas on Lake Michigan.
27.—Propeller Truesdell aground in Sturgeon Bay.
Schooner George C. Tinney twisted her rudder-head on Lake Michigan.
Schooner Thomas H. Howland damaged by collision with schooner St. Andrew at Chicago.
Steam-barge La Salle broke her machinery in Chicago harbor.
Barge Brunette ran into and damaged the schooner Gracie M. Filer at Chicago.
Scow Milton dismasted on Lake Michigan.
28.—Steam-barge S. C. Baldwin ran upon a reef and sank near Thunder Bay light. Released.
Schooner H. D. Moore ran into and damaged the propeller Scotia at Chicago.
Tug W. L. Ewing damaged by collision with schooner Queen City at Chicago.
Schooners Trio and Trueman Mass damaged by collision at Chicago.
Tug A. B. Ward damaged by collision with tug Burton at Chicago.
29.—Schooner Velocipede capsized and broke in two on Lake Michigan. Crew of two men lost.
Tug Belle King ran upon the rocks at Beach Point, Lake Erie.
30.—Scow Four Brothers damaged by striking the pier at Holland, Mich.

MAY, 1877.

1.—Schooner Bermuda damaged by collision with a bridge at Oswego.
2.—Tug W. E. Ewing slightly damaged by fire at Chicago.
Schooner M. Capron aground on Rocky Reef near Marblehead, Lake Erie. Released.
Schooner Clayton Belle ashore on Feathered Shoals, Lake Ontario. Released.
Steam-barge Ohio grounded on Limekiln Crossing, Detroit River. Released.
3.—Schooner Pelican struck on Limekiln Reef, Detroit River, and sunk. Released.
Schooner William Shupe damaged by striking the docks in the river at Oswego.
Schooner George M. Neelon ashore on the Chickens. Released.
4.—Steamer Flying Cloud sprung a leak at Chicago.
Steamer Colorado ran into and sank the schooner R. J. Gibbs, corn-laden, in Saint Clair River. Total loss.
5.—Schooner Morning Star aground on Goose Isle, Detroit River. Released.
Schooner J. N. Foster lost her mainsail in a gale on Lake Erie.
6.—Schooner George W. Adams aground on Limekiln Reef, Detroit River. Released.
Propeller Wisahickon and schooner Allegheny damaged by collision on Saint Clair Flats.
Schooners Nellie Teresa and Dominion damaged by collision in Bay of Quinte.
7.—Tug ran into and damaged the scow Success at Chicago.
Schooner Antares broke her mainboom on Lake Michigan.
Schooners L. M. Mason, Lyman M. Davis, and barge Guiding Star arrived at Chicago leaking.
Schooner Berriman sunk, and steam-barge D. W. Rust damaged and ran ashore to prevent sinking, by collision on Lake Huron. Berriman total loss. Amount, $100,000.
Andrew Halcom and Charles Myers, seamen on schooner Berriman, drowned by sinking of vessel.
8.—Propeller Nashua ran into and severely damaged the canal-boat G. L. Booth at Chicago.
Schooner E. A. Nicholson damaged by collision with schooner A. B. Moore at Chicago.
Schooner Helen Blood ran into and damaged the schooner Live Oak at Chicago.
Schooner Ellen Ellinwood ran into and damaged the tug Newel Avery at Whitehall.
Schooner Scotia arrived at Cleveland leaking.
10.—Schooner C. K. Nims ran into and damaged the schooner Gold Hunter on Lake Huron.

11.—Schooner Nevada arrived at Port Huron leaking.
Schooner San Diego aground in Saint Clair River.
12.—Schooner E. M. Portch, wheat-laden, sprang a leak on Lake Michigan and returned to Chicago.
Tug Torrent damaged by collision with tug Kingsbury at Muskegon.
Schooner Theodore Perry aground in Detroit River.
Tug Joe Heald slightly damaged by fire while towing on White Lake.
13.—Tug Nellie Richards burst a feed-pipe in Chicago Harbor.
Tug Zouave sunk at dock at Sombra, Saint Clair River.
Propeller Asia aground in Saint Clair River.
Tug River Queen damaged by fire at Port Huron. Amount, $1,000.
Schooner Hugh Coyne sunk in Lake Erie.
14.—Schooner David Ferguson aground in Sturgeon Bay. Released.
Schooner Annie Sherwood damaged by collision on Saint Clair Flats.
Propeller Java struck on Grosse Point, Lake Saint Clair, and sprung a leak.
15.—Schooner Annie O. Hanson lost some of her canvas in a squall on Lake Michigan.
Barge May Baxter sprung a leak by striking the ice, and sunk in Sarnia Bay.
Schooner Sardinia damaged by collision on Lake Michigan.
Barge Brunette ran into and severely damaged the schooner David Vance in the rivers.
Tug Sullivan ran into and damaged the schooner Andrew Jackson on Lake Michigan.
16.—Tug American Eagle ran into and severely damaged the tug A. B. Ward at Chicago.
Tug R. Davis lost her screw on Lake Michigan, off Michigan City.
Schooner L. C. Woodruff ran into and damaged the schooner A. Rust in the ice on Lake Huron.
17.—Schooner Eva burnt at Sturgeon Bay.
Barge McKerral, wheat-laden, cut by the ice and sunk near Nottawasaga Island.
Schooners Willie Lontitt and L. M. Mason damaged by collision on Lake Michigan, off Sheboygan.
Propeller Peerless damaged by getting a log in her wheel in river at Milwaukee.
Schooner Julia Larsen went ashore during a fog near Ludington, Mich. Released.
Captain of schooner T. C. Wilson knocked overboard and drowned in Lake Michigan.
Schooner Negaunee lost her jibboom in a jam on Saint Clair Flats.
19.—Schooner Watlin damaged by collision with schooner Adriatic at Chicago.
Schooner F. W. Gifford ashore on a reef in Georgian Bay. Total loss.
Schooner Honest John slightly damaged by a squall on Lake Michigan.
Schooner Driver lost some of her canvas and sprung a leak in a squall on Lake Michigan.
The ferry-boat Saginaw ran into and damaged the schooner Jane Ralston at Port Huron.
Steamer Pacific ashore on Keweenau Point, Lake Superior. Released.
20.—Schooner Julia B. Merrill slightly damaged by collision with a bridge at Chicago.
Scow Jennie Lind arrived at Detroit leaking.
Propeller City of New Baltimore sprung a leak on Saint Clair River.
Steam-barge Mary Mills ashore in Saint Clair River. Released.
Schooner British Queen aground at Belleville, Ontario. Released.
21.—Schooner G. Barber lost her foresail in a storm on Lake Michigan.
Schooners G. H. Warrington and H. A. Kent damaged by collision at Chicago.
Scow Dan. Sickles lost her jib-boom in a squall on Lake Michigan.
Schooner Hall ashore on Gull Shoals, Lake Ontario.
22.—Schooner J. W. Doane ran into and damaged the schooner Emma A. Maipes at Chicago.
Scow Lizzie water-logged on Lake Huron.
Scow J. B. Chapin sprung a leak and water-logged near Chicago.
Schooner Elizabeth Jones damaged by collision with schooner Mary L. Higgin off Long Point, Lake Erie.
23.—Schooner Peshtigo damaged by collision at Chicago.
Schooners C. L. Johnson and D. L. Filer damaged by collision at Chicago.
25.—Steamer Flora and schooner H. A. Kent damaged by collision at Milwaukee.
26.—Tug Rebel damaged by collision with schooner Barbarian at Chicago.
Propeller Riverside broke her crank-pin in Chicago Harbor.
Propeller Canister ashore on Fighting Island, Detroit River. Released.
27.—Steam-barge Oscar Townsend arrived at Marquette in a disabled condition.
Propeller Europe, wheat-laden, arrived at Port Colborne leaking.
28.—Schooner Kate Winslow damaged by collision with steam-barge Charles Reitz at Chicago.
Propeller Wisahickon aground on Grosse Isle, Detroit River.
Schooner John S. Richards damaged by a squall in the Straits.

29.—Steamer Saint Louis broke her piston on Lake Erie.
Steam-barge Oakland struck West Sister Island Reef and sunk in Lake Erie.
Propeller Nahant aground in Detroit River. Released.
Scow Milton and schooner W. H. Rounds damaged by collision at Milwaukee.
William McBeth, sailor on tug Laketon, drowned in Saginaw Bay.
Tug G. W. Gardner damaged by fire at Buffalo.
30.—Schooner J. & A. Stronach sprung a leak on Lake Michigan.
Schooner Walters, lumber-laden, sunk in Saint Lawrence River.
Schooner William Home aground at Wyandotte. Released.
Bark Red, White, and Blue ashore on Middle Island, Lake Huron. Released.
31.—Tug Dick Davis sprung a leak and sunk in river at Milwaukee.
Schooner Saviland damaged by a squall on Lake Michigan.
Schooner T. Y. Avery went ashore on Skillagallee Reef during a dense fog. Released.

JUNE, 1877.

1.—Schooner Rising Star damaged by collision with a bridge at Chicago.
Tug Pringle destroyed by fire in the Saint Clair River; loss, $21,000.
Schooner A. J. Rogers severely damaged by a squall on Lake Michigan.
Schooners Westchester, Pilgrim, and Carlingford damaged by a gale on Lake Michigan.
Tug Constitution damaged by collision at Chicago.
Barge Ellen Williams and schooners Belle Brown, Kate Lyons, and F. L. Danforth damaged by a gale on Lake Michigan.
Schooners C. G. Mixen and Guido Pfister arrived at Milwaukee in damaged condition, caused by a gale on Lake Michigan.
2.—Steam-barge George Dunbar broke her machinery on Lake Michigan.
Bark Red, White, and Blue arrived at Chicago in damaged condition, caused by a gale on Lake Michigan.
Schooner Camanche aground in the Straits. Released.
Barge Mercury ran into and damaged the schooner Day Spring, at Ludington, Mich.
Schooner Lyman Casey lost her jib-boom and bowsprit by collision in the Welland Canal.
3.—Schooner Petrel arrived at Chicago leaking.
Steam-barge George Dunbar damaged by collision with a dock in the river at Chicago.
Schooner William Jones lost her fore-topmast on Lake Michigan.
Tug Relief aground at Saint Clair Flats. Released.
4.—Propeller J. Bertschy ashore on Port Austin Reef. Released.
Schooners Ethan Allen and Glad Tidings damaged by collision at Chicago.
Schooner Gracie M. Filer lost her jib-boom in Chicago Harbor.
Scow J. P. Jones ran into and damaged the ferry-boat Excelsior, at Detroit.
Propeller Favorite broke her crank off Sheboygan, Lake Michigan.
5.—Tug Hector broke her machinery on Saint Clair River.
Scow Mary Ann damaged by a gale on Lake Erie.
Two fishermen drowned in Green Bay, Lake Michigan.
6.—Schooner H. A. Kent damaged by collision with schooner W. Y. Emery, at Cleveland.
Steam-barge William Crippin aground on a rock in the river at Milwaukee.
Schooner William Home aground in Saint Clair River.
7.—Propeller Oswegatchie damaged by fouling with propeller Dean Richmond, at Chicago.
Canal-boat Cuba sprung a leak and water-logged at Chicago.
Schooners Montauk and Two Fannies arrived at Chicago in a leaky condition.
Schooner Mary McVey broke her rudder by collision with a dock at Chicago.
Tug E. P. Perry broke her shaft in the river at Chicago.
Schooner Morning Star aground near Grass Island, Green Bay. Released.
Propeller Winslow broke her crank while leaving Buffalo.
Schooner F. Leighton ashore at Forty Mile Point, Lake Huron. Released in a leaky condition.
8.—Schooner Maggie Thompson lost some of her canvas on Lake Michigan.
Tug Newell Avery burst a flue on White Lake.
Tug Graham broke a point on White Lake.
Schooner Speed damaged by collision with tug American Eagle, at Chicago.
9.—Bark Favorite arrived at Chicago minus some of her canvas.
Steamer R. N. Rice badly damaged by fire, at Detroit; amount, $40,000.
Steam-barge Fayette aground in river at Racine. Released.
Schooner Dolphin damaged by collision in Detroit River.

Scow Ahnapee and schooner Cuyahoga damaged by collision on east shore of Lake Michigan.
Schooner Wayne lost her jib-boom by collision during a gale at Kingston, Ontario.
Steamer Keweenau arrived at Port Huron in disabled condition.

10.—Schooner Skylark struck a rock and sunk in Saint Lawrence River. Raised.
Schooner Garibaldi damaged by collision with a dock at Buffalo.
Schooner King Sisters damaged by a gale on Lake Erie.
Schooners Harriet Ross and J. H. Mead damaged by a gale on Lake Erie.
Schooner W. H. Brown lost her main and mizzen masts in the passage from Lake Superior.
Schooner Lewis Ross damaged by collision with a dredge at Port Colborne.
Bark British Lion lost a topmast in a gale on Lake Erie.

11.—Schooner Louise McDonald damaged by collision with schooner Gracie M. Filer, at Chicago.
Schooner Charles Hinckley damaged by a gale on Lake Superior.
Propeller Annie L. Craig arrived at Detroit damaged and leaking.

12.—Schooner Cornelia ashore in Green Bay, Lake Michigan.
Scow Selt and schooner Myrtle damaged by collision at Chicago.
Propeller Depere ran into and damaged the schooner Hope at Milwaukee.
Steamer City of Toronto broke her machinery on Lake Ontario.
Schooner J. G. Masten ran into and damaged the schooner Means at Buffalo.

13.—Schooner Mary A. Gregory had her jib-boom broken by a gale on Lake Michigan.
Schooner Winona ashore near Portage, Lake Michigan. Released.
Tug Farragut sunk at Toledo.
Schooner Belle Walbridge and scow Radical damaged by collision off Chamber's Island light.

14.—John Foley, sailor on scow Monitor, fell overboard and drowned at Milwaukee.
Steamer Manitoba ashore at Cockburn Cut, Lake Huron.

15.—Scow R. D. Holt damaged by collision at Chicago.
Schooner Gerrit Smith ashore on Garrison Point, Toronto Harbor. Released.
Schooner Bettie Calkins damaged by a gale off Big Point Sauble.
Schooner Joseph Duval and scow U. S. Grant damaged by a collision in a fog on Lake Michigan.
Schooner Red Wing damaged by a gale at Buffalo.
Schooner Live Oak damaged by a gale on Lake Michigan.
Scow Greenback damaged by collision with propeller Badger State, in Detroit River.

16.—Schooner Lady McDonald went ashore during a dense fog in Little Sandy Bay, Lake Ontario.
Scow Asa Childs damaged by collision in Saint Clair River.
Propeller Skylark broke her machinery on Lake Michigan.

17.—Tug J. B. Merrill broke her wheel in the river at Milwaukee.
Propeller Antelope broke her machinery while towing on Lake Erie.
Schooner New Dominion sprung a leak and sunk at Oswego.

18.—The schooners Kate Gillet, Lena Johnson, Melvin S. Bacon, and scow Hunter damaged by a gale on Lake Michigan.
Brig C. G. Breed arrived at Port Huron minus a jib-boom.
Tug L. B. Johnson broke her wheel in the river at Chicago.
Schooner Mineral State aground on Grosse Isle. Released.

19.—Schooner Sophia Minch arrived at Chicago in a damaged condition, caused by a storm on Lake Michigan.

20.—Schooner Evaline struck by lightning and badly damaged on Lake Michigan.
Propeller City of New York and schooner America collided near Whitefish Point, Lake Superior; propeller sunk near shore; schooner filled with water and water-logged.
Schooner Gertrude ashore on Racine, North Point, Michigan. Released.
Barge Eliza arrived at Buffalo minus the greater portion of her deck-load.
Schooner Acorn on Meomquam Point, Lake Huron.
Scow Harriet Ann beached at South Haven. Released.

21.—Steam-barge Tempest and schooner Gesine damaged by collision on Lake Michigan.
Bark Norway lost her jib-boom by collision with schooner Laura Bell, on Lake Erie.
Schooner Geo. W. Sloan damaged by striking the pier at Cleveland.

22.—Steam-barge Burlington sprung a leak in Black River.
Steam-barge Dunlap damaged by collision with a bridge at Bay City.
Schooner M. C. Cameron ashore near Goderich, Lake Huron.
Steam-barge H. C. Schnoor aground in Sturgeon Bay, Lake Michigan. Released.

23.—Schooner Gamecock damaged by collision with schooner Antaunte at Chicago.
Schooners J. G. Masten and Thos. Garvin damaged by collision at Chicago.

21.—Schooner Cossack and tug Mary ashore on Morgan's Point, near Port Colborne. Cossack released.
Schooner Butcher Boy aground on Grassy Island, Detroit River. Released.
Schooner Nellie Teresa grounded in harbor at Belleville, Canada. Released.
Schooner Elva damaged by collision with a dredge at South Haven, Lake Michigan.
Schooner Raleigh damaged by a squall off Kenosha, Lake Michigan.
25.—Schooner Montpelier had her jib-boom broken by collision at Chicago.
Scow Rosabelle capsized and lost her deck-load in a squall on Lake Saint Clair.
Schooner Caroline Marsh ran ashore on Ford's Shoal, Lake Ontario, during a dense fog. Released.
Schooner Lucca lost some of her canvas in a squall on Lake Erie.
Schooners W. B. Allen, Monticello, Sweetheart, Sunnyside, Ostrich, Annie Vought, Wenona, Lady Dufferin, Nellie Gardner, W. H. Rounds, Crossthwait, and Contest damaged by gale at Chicago.
26.—Barge G. P. Heath damaged by fire on Lake Michigan.
27.—Tug Relief aground in Saint Clair River. Released.
Propeller Susquehanna broke her wheel by a collision with a dock at Milwaukee.
28.—Schooner Harry Bissell arrived at Chicago minus her mainsail.
Schooner Negaunee arrived at Chicago leaking.
Tug Parker ran into and damaged the propeller James Fish at Chicago.
Tug J. P. Clarke aground on Fighting Island, Detroit River.
A. J. Woolister, sailor on propeller Caldwell, drowned at Bay City, Mich.
29.—Steam-barge George Dunbar broke her machinery on Lake Michigan.
Schooner Adriatic lost some of her canvas in a gale on Lake Michigan.
Tug I. M. Masters broke her cylinder-head near the Charity Islands.
Bark America lost her mizzenmast in a gale on Lake Michigan.
Schooners Rouse Simons and C. K. Dixon damaged by a gale on Lake Michigan.
Schooner David Wagstaff damaged by a gale on Lake Huron.
30.—Propeller Messenger damaged by fouling with schooner Mary A. Gregory at Chicago.
Schooner Tuscola damaged by collision at Chicago.
Steamer Clara damaged by a gale at Detroit.
Schooner William Aldrich and barge Mars damaged by a squall off Little Point Au Sable.
Schooner Lincoln Dall damaged by a gale on Lake Erie.
Schooners John Minor, Mary B. Hale, and Mary Collins damaged by a gale on Lake Michigan.

SAML. W. RHODE,
Sergeant Signal Service, U. S. A.

	1876.						1877.						Total.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Sunk	3	6	13	12	4	....	....	....	....	6	10	3	57
Damaged, disabled, &c	64	67	77	80	28	4	....	....	....	11	53	120	504
Ashore and aground	18	9	20	35	17	8	....	....	....	6	23	26	162
Sprang a leak	8	9	23	29	1	1	....	....	....	5	16	7	98
Collisions	23	20	18	14	10	....	....	....	....	5	29	25	144
Damaged by fire	3	4	2	2	1	....	....	....	....	....	4	2	18
Destroyed by fire	2	....	3	3	1	....	....	....	....	2	1	1	13
Water-logged	2	1	14	7	1	....	....	....	....	1	2	2	30
Struck by lightning	1	....	....	....	....	....	....	....	....	....	....	1	2
Dismasted	....	....	....	4	1	....	....	....	....	1	....	....	6
Exploded boiler	....	....	....	....	....	....	....	....	....	....	....	....	0
Lives lost	29	5	10	11	16	2	....	....	....	2	3	4	82

PAPER 43.

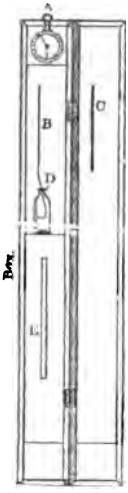
NASHVILLE, TENN., *June* 26, 1877.

SIR: I have the honor to submit herewith a report of observations made in the car of the balloon Buffalo, on a voyage from Nashville, Tenn., to Gallatin, Tenn., a distance of twenty-six miles, June 18, 1877, from 5.03 p. m. to 7.18 p. m.

* * * * * * *

The following is a detailed description of the arrangement of instruments for the ascension. Taking the long, narrow, wooden box in which an ordinary mercurial

barometer is transported, the Signal-Office aneroid was first placed securely in the top, or end, with the face slightly raised above the edge of the box; directly below this and to the *outer* side was fastened the wet bulb of the hygrometer, the scale on a level with the edge of box. At the same height on the *inner* side of the box *lid* was placed the dry bulb of hygrometer.

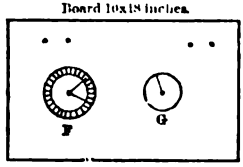


Arrangement of instruments in car of balloon: A, Signal-Office aneroid; B, hygrometer, wet bulb; C, dry bulb; D, bottle; E, standard thermometer; F, clock; G, Professor King's aneroid.

The two bulbs were thus about four inches apart when the box was open, and the lid could easily be closed without their coming in contact. Directly under the wet bulb was a small flat-sided bottle filled with rain-water, into which the hygrometer-wick was placed, one extremity projecting and drawn over the bulb.

Below the bottle was the standard exposed thermometer, fastened to the center of the bottom of the box by the brass spring on its back. The record-book and pencil were fastened to the top of the box by a cord. On a board having a surface of 18 inches by 10 inches and ¼ an inch thick, was fastened a small clock, such as is used by engineers, also Professor King's aneroid barometer (adjusted).

In addition to these instruments, a compass, sand-glass, maps, and ozone test-papers were taken. A lighted Davy's safety-lamp was also taken for night-observations, being loaned for the occasion by Dr. Geo. S. Blackie, professor of chemistry. The long box was fastened upright in the basket, so as to bring the barometer and hygrometer above its rim, and the board was tied alongside entirely above the rim of the basket.



The ascent was made from a vacant lot on one of the main streets of the city, and attracted a large crowd. The Buffalo is made of Wamsutta muslin, and has a capacity of 92,000 cubic feet. The car is of wicker-work, about four feet wide, seven feet long, and three feet deep, and as it contained seven persons, besides a large quantity of provisions, ballast, &c., on this voyage, it can be seen there was not much room for work.

The hour fixed for the ascent was 4 p. m., but a heavy shower of rain interrupted the inflation and delayed the departure. I was on the ground with the instruments at 3.30 p. m., and at 3.38 p. m. began the series of observations. At 5 p. m. I had taken my place in the car and secured the instruments, and at 5.03 p. m. the balloon left the earth.

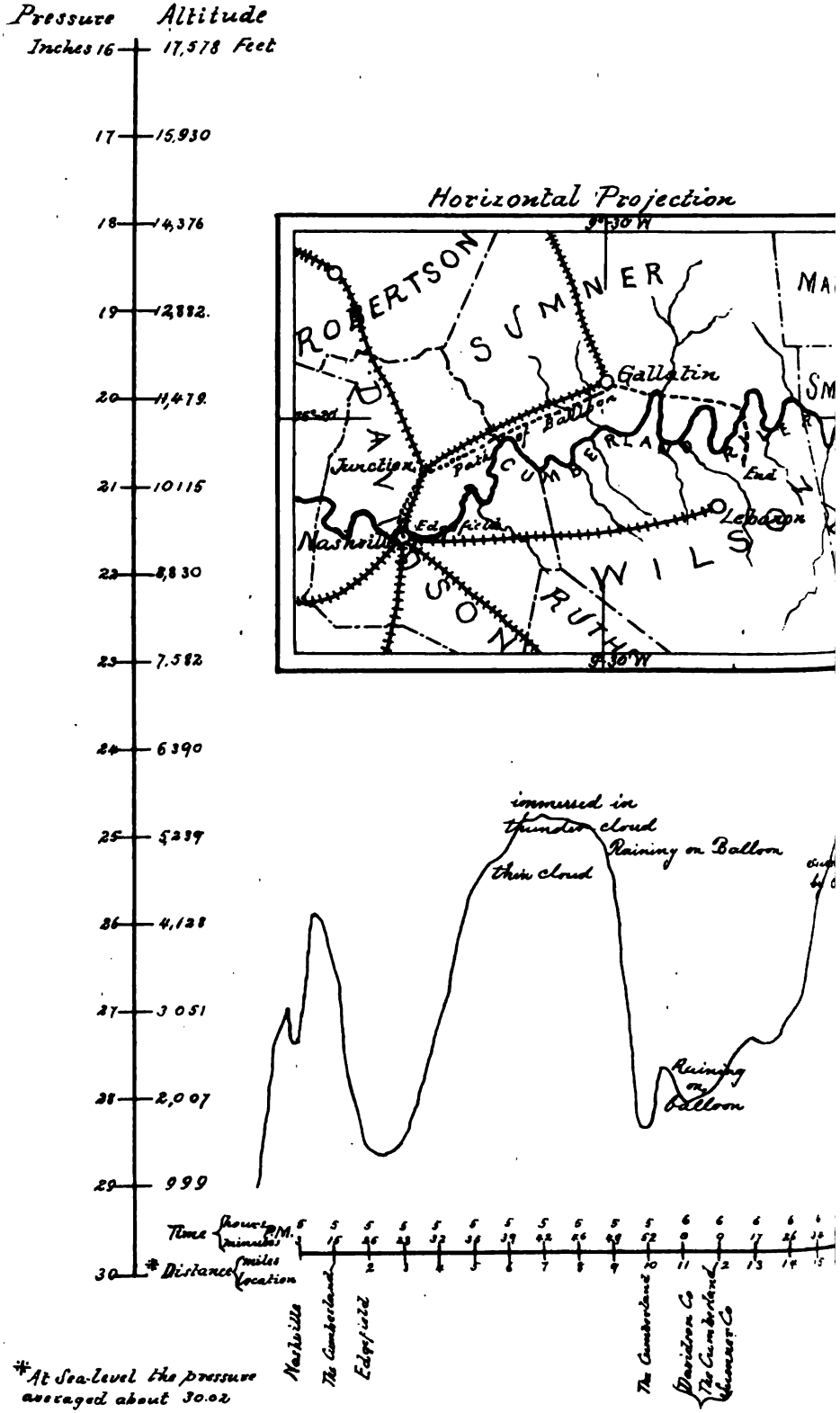
The gas used was carburetted hydrogen from the street, and it remained perfectly transparent during the voyage. At the moment of starting, the sky was about three-fourths covered with cumula-stratus clouds, but the sun was shining brightly on the balloon, and it rose rapidly, being carried due north by a gentle breeze. At 5.15 p. m. we were over the Cumberland River, 2,600 feet high and half a mile from the point of starting. By discharging a small quantity of ballast we rose to a height of 4,200 feet, passing over the town of Edgefield, and descending beyond it to within 1,300 feet of the earth. The contents of one sand-bag was now emptied, and the balloon rose again, passing through a thin vapor which appeared below like fog.

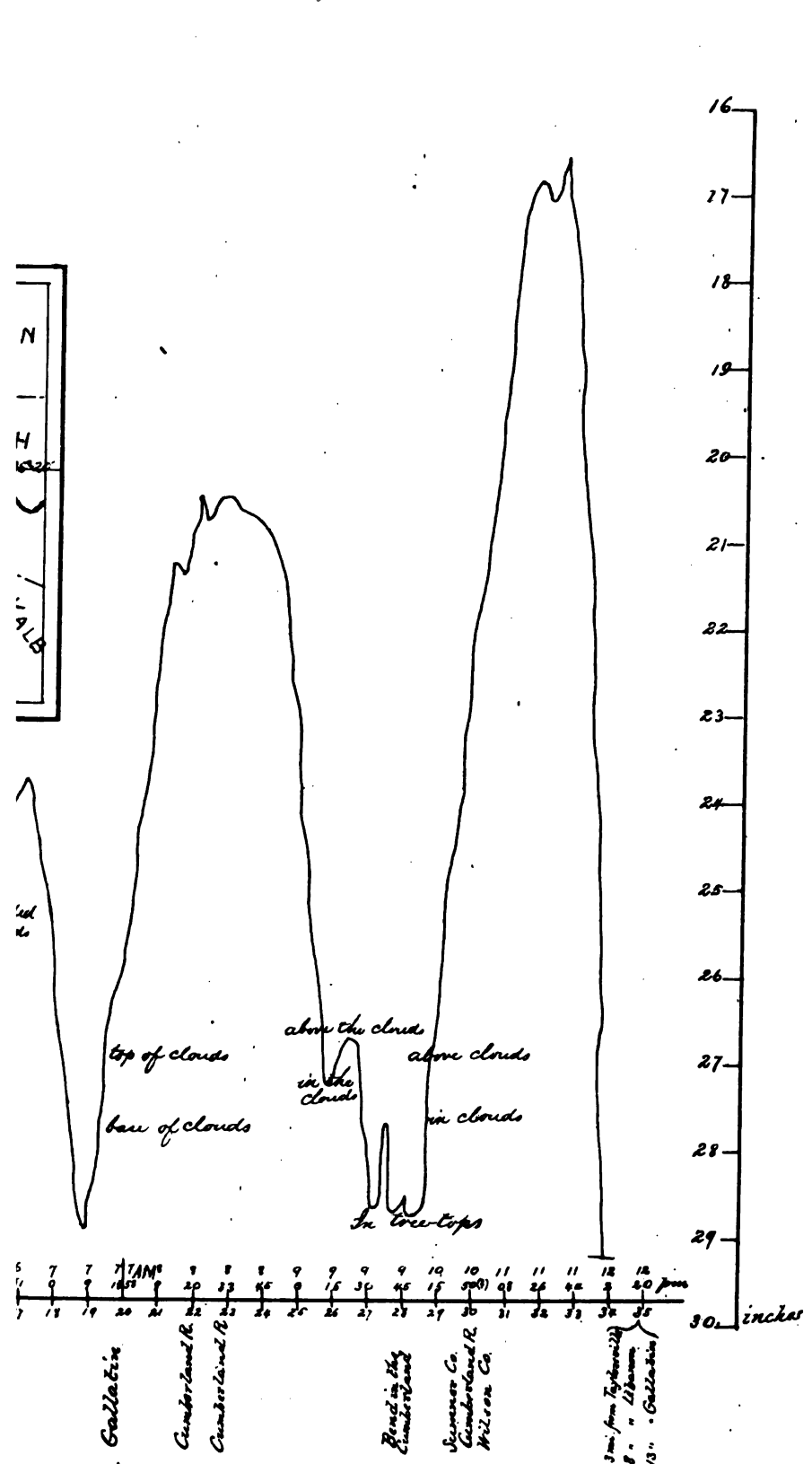
Meanwhile a dense wall of threatening inky-black nimbus cloud was rapidly approaching us from southwest, and the rain could be plainly seen falling in waving sheets to the earth below it. The sun was shining brightly under the border of a western projection of this cloud, and the familiar fan-shaped shadows, resembling the merry dancers of the aurora, were projected upon the earth almost beneath the car.

As the cloud came alongside it appeared in great commotion, as if being torn by violent winds, though no wind was felt in the car. Loud thunder was now heard, and seemed very close, indeed, as the balloon was in the ragged border of the cloud. At 5.46 our direction had changed to north-northeast, and the thunder-cloud had passed under us, pouring a perfect deluge of water on the country below, while it is rising rapidly around us. Altitude, 5,540 feet, and we are floating along immersed in the dense fog, which pours upward, and shuts off all sight of the earth or sky. At 5.50 we had fallen about 500 feet into the cloud, and the rain was heard pattering on the aerostat above. The balloon soon emerged from the cloud and it passed rapidly away, leaving the sun shining again. We now looked anxiously for a rainbow, but none appeared, much to our disappointment.

The Cumberland River was crossed again at 5.52 p. m., and at 5.54 a beautiful shower of rain was seen falling to eastward, apparently about one mile distant.

The cloud from which this shower fell, appeared to project like an arm, cone-shaped, apex toward us, from the main body of vapor, and its upper surface seemed on a level with us. The rain, as it fell, waved in the brisk wind like an immense piece of canvas. We soon afterward encountered this breeze, and were carried along rapidly at a height


Pressure
Inches
Altitude
Feet
16
17,578
17
15,930
18
14,376
19
12,882
20
11,479
21
10115
22
8,830
23
7,582
24
6390
25
5239
26
4,128
27
3051
28
2,007
29
999
30
Horizontal Projection
9°30'W
ROBERTSON
SUMNER
Gallatin
Junction
Nashville
Lebanon
WILSON
RUTH
9.30'W
immured in thunder cloud
Raining on Balloon
their cloud
Raining on Balloon
Time
hours
minutes
P.M.
Distance
miles
location
Nashville
The Cumberland
Edgefield
The Cumberland
Davidson Co.
The Cumberland
Sumner Co.
*At Sea-Level the pressure averaged about 30.02
1st Voyage June 18th 5h to 7h 10m P.M. Nashville



Gallatin 2nd Voyage June 19th 7 51 to 12 20 pm. Gallatin to End

of about 2,000 feet. At 6.09 the Cumberland River was crossed again, another light shower of rain falling on the balloon at 6.05 to 6.10 p. m.

The sky was at this time overcast with cumulo-stratus and nimbus clouds, but they soon moved away, and at 6.35 p. m. the sun was shining, and under its influence the aerostat rose rapidly.

The cumulo-stratus assumed more the cumulus form, and at 6.45 p. m. we were the center, apparently, of a circle of the fleecy vapor masses. Small patches of filmy cirri were visible above, floating slowly from the west, and the speed of the balloon diminished as it ascended. The sun was now about 5° above the horizon, and shining brightly on the balloon. I exposed ozone test-papers at 6.35 p. m.; one in sunlight and one in shadow.

The one in sunlight was colored in half an hour to 6 on the scale (Schonbein). The one in shadow was tinged slightly. We had now passed the line of Davidson, and were in Sumner County, Tennessee.

At 7.03 p. m. the greatest altitude of the voyage was reached, 6,580 feet, and the clouds were floating below in fleecy tufts. The town of Gallatin was in plain view, and we commenced at once to descend slowly toward it. Professor King decided to stop there, as night was coming on, and the country beyond was timbered and sparsely settled. As we neared the earth the population began pouring toward the balloon, and when the drag-rope touched the ground, at 7.16 p. m., it was soon caught up and secured to a tree. We were then drawn to the ground in an open field half a mile from the center of Gallatin and twenty-six miles from Nashville, touching the earth at 7.18 p. m.

The travelers stepped from the car, and I proceeded to make the series of ground-readings, commencing at 7.25 p. m. The twilight was deepening when I had recorded the last observation, and the balloon had been towed into the town, where the basket was loaded with stone and left in the care of the town police for the night. The party was then entertained at supper by the President and Faculty of Neophogen College, and afterward by the Mayor and town council, who spared no effort to make our short stay most delightful.

Especial mention is due to Professor Casimir Zdanowicz for attentions shown your observer.

Professor King's aneroid was adjusted to the reading of the Signal-Office aneroid before starting from Nashville, and was used for one observation on this voyage; the Signal-Office instrument reading only to 24 inches. The valve-rope was not used by the aeronaut on this voyage.

No feeling of discomfort was experienced by any one of the party during the voyage, and our overcoats were useless baggage.

Very respectfully, your obedient servant,

A. C. FORD,
Sergeant Signal-Service, U. S. A.

To the CHIEF SIGNAL-OFFICER,
Washington, D. C.

Record of observations taken on balloon voyage from Nashville to Gallatin, Tenn., June 18, 1877. Prof. S. A. King, aeronaut; Sergeant A. C. Ford, Signal Service, U. S. A., observer.

Date and time.		Aneroid barometer.	Hygrometer.		Remarks.
1877.	P. M.		Dry bulb.	Wet bulb.	
June 18	3.38	29.010	87	79	Taken on ground near balloon, Nashville, Tenn.
	3.40	29.050	87	79	
	3.42	29.050	87	79.5	
	3.44	29.049	87	78.5	
	3.46	29.050	87	81	
	3.48	29.025	87	81	
	3.50	29.025	87.5	81.5	
	3.52	29.020	87.5	81.5	
	3.54	29.020	87.5	81.5	
	3.56	29.025	88.0	82	
	5.00	29.025	88.0	83	
					Left the ground 5.03 p. m.
	5.05	28.210	87	76	
	5.06	27.950	85	74	
	5.07	27.520	83	72	Moving due northward.
	5.08	27.400	82.5	73	
	5.10	27.110	82	75	
	5.12	27.050	82	76	
	5.15	27.425	82	76	Cross Cumberland River about half-mile from starting point.
	5.18	26.400	80	75.5	Direction north.
	5.20	25.950	79	74.5	
	5.28	28.500	79	74	Passing over Edgefield.
	5.30	28.700	80	75.5	
	5.35	27.400	79.5	74.5	
	5.40	25.550	79	74	Pass through thin cloud, like a vapor.
	5.42	25.260	77.5	71.5	Cloud appears below us like fog.
	5.44	24.600	76.5	71	Thunder heard from a cumulus cloud in southwest.
	5.46	24.920	75	69.5	Direction north-northeast above a cumulus cloud which is rapidly rising.
	5.50	24.830	74	69	Immersed in thunder-cloud.
	5.52	25.230	74	69	Raining on balloon; cross Cumberland River.
	5.54	25.845	74	70.5	Raining to eastward.
	5.56	27.000	75	72	
	6.02	28.290	76	73	Carried along briskly by the breeze attending rain-fall.
	6.05	27.750	77	74	Raining on balloon.
	6.10	28.050	78	75	Raining on the balloon.
	6.15	27.955	79	75	
	6.20	27.600	79	74	Shower to eastward.
	6.25	27.420	79	74	
	6.28	27.412	78.5	74	Distant thunder.
	6.35	26.960	78.5	73.5	Sun shines on balloon, causing it to rise.
	6.40	26.550	76.5	71	
	6.45	25.600	75	69	Surrounded by fleecy vaporous masses of cumulus clouds; filmy cirri visible above.
	6.50	25.100	72	66	
	6.52	24.500	70	65	
	6.55	24.100	68	62	
	7.00	24.000	67	63	Have passed from Davidson into Sumner County.
	7.03	23.800	67	63	Professor King's barometer (adjusted) used.
	7.05	24.000	67	63	Clouds below balloon; sun sets behind a bank of stratus.
	7.10	25.800	68	66	
	7.12	26.800	69	64	
	7.15	27.500	71	70	
					Drag-rope (350 feet long) touched the ground at 7.16 p. m.
	7.18	.....	.....	.....	Landed half-mile from center of Gallatin, Tenn., and 26 miles from Nashville.
	7.25	29.000	73	70	Taken on the ground at Gallatin, Tenn., after landing.
	7.28	29.050	73	70	
	7.30	29.050	73	70.5	
	7.32	29.060	72.5	70	
	7.34	29.060	72.5	70	This rise in aneroid may be due to instrumental error or fluctuations due to strain of aneroid.
	7.36	29.080	72.5	70	
	7.38	29.105	72	70	
	7.40	29.105	72	69.5	
	7.42	29.105	72	69.5	
	7.44	29.110	72	69.5	

PAPER 44.

CAPE HENRY, VA., *April* 10, 1877.

SIR: In compliance with the following telegram:

"WASHINGTON, D. C., *March* 27, 1877.

"To Sergeant STEIN, *Cape Henry:*

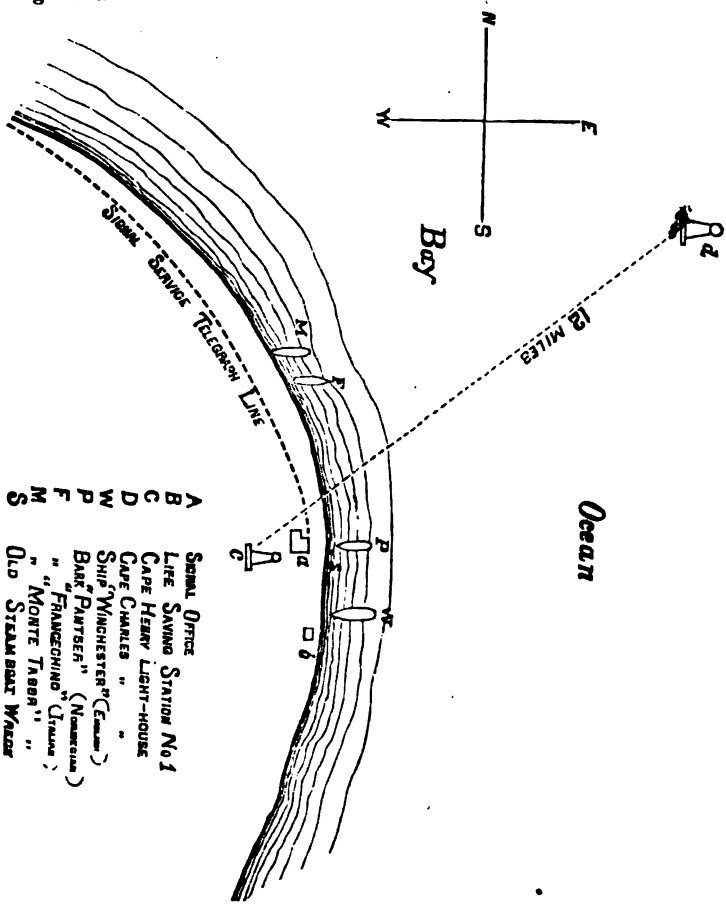
"The Chief Signal-Officer directs me to say that he is very much pleased with your conduct and good sense displayed during the recent storm, and desires you to make a full report of the storm, and to include in same all messages sent or received concerning the wrecked vessels.

"C. E. KILBOURNE."

I have the honor to submit the following report of the storms which prevailed on this coast from March 21 to March 30, and also an account of the marine disasters which occurred in the vicinity of this station during that time.

At 12.40 a. m. of March 21, cautionary signals were ordered up, and, although the weather was fair at the time, it soon was proved how correct the forecast was.

The day opened cloudy, with rapidly falling barometer and a gentle to fresh south wind. In the afternoon, at 3 p. m., rain set in, and during the evening a thick fog spread suddenly over the sea, dissipating at times as rapidly as it had made its appearance. A fog of this kind is one of the greatest dangers to be encountered in this vicinity by mariners, as it seems that the then only occasional sight of the two lights (Cape Henry and Cape Charles lights) at the entrance of the bay causes them to come too close to the peculiarly formed shore, and, before they are aware of its proximity, are fast aground.



Between 8 and 9 o'clock p. m., during these occasional liftings of the fog, I noticed, southeast of the Signal-Office, a bright flash light; but, as it was the customary light

shown by vessels wishing to attract the attention of the pilots, I did not observe it long. Rain was continuing, and barometer still rapidly falling at last observation.

At 1.45 a. m. of March 22, the wind shifted to northeast and increased in force. The day opened rainy and thick, with stationary barometer, constantly increasing northeast winds, and unusually heavy sea from same direction. At the first lookout in the morning, at the same point where on the previous night I had observed the flash-light, a large full-rigged ship was lying. As I could not distinguish from the office whether she was anchored or aground, I went down the beach to ascertain, and was in time to see the surf-boat of the Life-Saving Station No. 1 trying to make her way to the vessel, but the current was so strong that after several unsuccessful attempts it had to be given up.

I immediately returned to station, and hoisted "attention signals," to be in readiness in case weather should become clear enough to open communication with the stranded vessel by means of the "international code signals," which, after a short time, was effected, and constantly kept up while she remained ashore. At 1 p. m. the wind had reached a velocity of 48 miles per hour, and toward evening shifted to the northwest, when rain ceased and weather became clear. Cautionary signals were lowered at 6.35 p. m., and wind gradually abated, although blowing very brisk until next morning, sea continuing very heavy throughout the next day.

On March 24, at 7.25 p. m., cautionary signals were again ordered up, and about twenty-four hours later one of the most severe storms of the season was approaching this station.

March 25, opened fair, with a brisk southeast wind, and toward night the barometer commenced falling rapidly, and rain set in, which continued at intervals through the night and following day, accompanied in the morning of March 26 by thick fog, during which three barks were stranded near this station, within a mile of each other. The barometer fell rapidly throughout March 26, and the center of the storm was apparently near this station at 11.4 p. m. observation, when the barometer stood at its lowest (29.330 inches), and a comparative calm was prevailing. During the night the wind shifted suddenly to northwest, and rapidly increased to a velocity of 40 miles per hour at 9 a. m. of March 27, continuing to blow at this rate until 12.20 p. m. of March 30, almost four days in succession, during which the barometer rose steadily, and weather became clear and settled.

I submit herewith a rough diagram of the coast at this point, and of the relative position of the signal-office and the vessels which were stranded during the storms; and, in order to show the work done and the benefit derived by these vessels from the Signal and Telegraph station at this point, I embody the following messages transmitted from and to this station, which will fully demonstrate that the Signal Service in these instances has indirectly been the means of saving human life, and property of great value; and perhaps it is appropriate for me to mention here that all parties concerned have, in very flattering terms, expressed their high appreciation of the services rendered by the signal service in connection with these vessels:

1.

CAPE HENRY, VIRGINIA, *March* 22, 1877.

B. & J. BAKER & CO., *Norfolk:*

Large ship ashore at Cape Henry, 7.50 a. m.

STEIN, *Sergeant.*

2.

CAPE HENRY, VIRGINIA, *March* 22, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

Large ship went ashore near this station last night. No particulars can be ascertained at present as the weather is too thick to open communication, and the life-saving crew of station No. 1 was driven back by the heavy sea when attempting to board her. Wreckers have been notified.

8.25 a. m.

STEIN, *Sergeant.*

3.

CAPE HENRY, VIRGINIA, *March* 22, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

Communication through means of international signal-code has been effected by me with ship ashore at this station. She wants two steam-tugs, and I shall telegraph to B. & J. Baker & Co., wreckers, at Norfolk, to send them.

8.45 a. m.

STEIN, *Sergeant.*

4.

CAPE HENRY, VIRGINIA, *March* 22, 1877.

B. & J. BAKER & CO., *Norfolk:*

Ship signals to me to send for two steam-tugs. Send them and answer when they can be expected.

8.47 a. m.

STEIN, *Sergeant.*

5.

CAPE HENRY, VIRGINIA, *March* 22, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

Have hoisted signals to ask ship's name or signal numbers, but no answer as yet. They desire to get a line from shore, and I have communicated the facts to the keeper of life-saving station No. 1, who is now trying to fire a line to her.

9.25 a. m.

STEIN, *Sergeant.*

6.

CAPE HENRY, VIRGINIA, *March* 22, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

Name of ship ashore is Winchester, from Liverpool, bound, in ballast, to Norfolk; Captain McDonald. Crew 27, all told. All safe.

9.40 a. m.

STEIN, *Sergeant.*

7.

CAPE HENRY, VIRGINIA, *March* 22, 1877.

B. & J. BAKER & CO., *Norfolk:*

Captain McDonald, of the ship Winchester, ashore, desires to have fifty men to discharge ballast.

9.45 a. m.

STEIN, *Sergeant.*

8.

NORFOLK, VA., *March* 22, 1877.

Captain MCDONALD, *Ship Winchester, Cape Henry, Virginia:*

Bakers have both ready, which will go down as soon as the weather moderates. We have cabled your owners.

10.25 a. m.

REYNOLD BROTHERS.

9.

WASHINGTON, D. C., *March* 22, 1877.

WILLIAM HENELY, *Keeper of Life-Saving Station No.* 1:

Let no means be untried to get line to vessel ashore at your station. If she is too far from shore to be reached by mortar it seems to me you ought to be able to carry line to her with surf-boat. If surfmen put on cork-jackets there is little danger of loss of life should boat upset. At Racine one of our surfmen took line to stranded vessel through surf where surf-boat could not live. With Merriman's rubber life-saving dress, suppose you try that. It is impossible for a man to drown in it. Do not let the service be disgraced in your hands. Report progress by telegraph from your station.

11.45 a. m.

S. I. KIMBALL,
In charge of Life-Saving Service.

10.

CAPE HENRY, VIRGINIA, *March* 22, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

Would state that the surfmen of life-saving station No. 1 attempted twice to reach ship with surf-boat, but each time were driven back by the heavy sea. They are now, with the assistance of the chief mate of stranded vessel, trying to get line to her.

11.55 a. m.

STEIN, *Sergeant.*

11.

CAPE HENRY, VIRGINIA, *March* 22, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

After unsuccessful trials to fire a line to ship by mortar, a line from vessel has been got to the shore by means of being fastened to a barrel, and attempts are being made to run life-car back and forward for the purpose of bringing crew ashore.
1.50 p. m.

STEIN, *Sergeant.*

12.

WASHINGTON, D. C., *March* 22, 1877.

Sergeant STEIN, *Cape Henry, Virginia:*

General Myer directs that you report as rapidly as you secure additional information in regard to ship Winchester, ashore at your station.
3.05 p. m.

C. E. KILBOURNE.

13.

WASHINGTON, D. C., *March* 22, 1877.

Sergeant STEIN, *Cape Henry, Virginia:*

Are the crew of the Winchester all safe, as reported in your telegram of 9.30 a. m.?
3.06 p. m.

MYER, *General.*

14.

CAPE HENRY, VIRGINIA, *March* 22, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

Yes; crew of Winchester all safe so far; will have additional information soon.
3 10 p. m.

STEIN, *Sergeant.*

15.

CAPE HENRY, VIRGINIA, *March* 22, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

Life-car is now steadily working; seven of the crew have been gotten ashore.
4.27 p. m.

STEIN, *Sergeant.*

16.

CAPE HENRY, VIRGINIA, *March* 23, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

Ship Winchester during last night has been driven high up on the shore, and is now lying steadily, without leaking to any extent, head toward shore. No danger anticipated. One of the wrecking-tugs has just arrived, but has anchored off the ship, sea being too heavy to commence work immediately.
8.45 a. m.

STEIN, *Sergeant.*

17.

CAPE HENRY, VIRGINIA, *March* 23, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

Captain McDonald of the Winchester came ashore this morning and sent his men back to the ship, in order to assist when wrecking-tug is able to lay cables; meanwhile the life-saving car continues in working order. Sea continues heavy, and wrecking-tug has not yet succeeded to come closer. Captain McDonald informs me that the most blame in the disaster is to be attributed to the fact that no pilots were about to notice his flash-lights when nearing the capes.
11.58 a. m.

STEIN, *Sergeant.*

18.

CAPE HENRY, VIRGINIA, *March* 23, 1877.

S. I. KIMBALL,
In charge of Life-Saving Service, Treasury Department, Washington:

Communications have been established since yesterday. No lives endangered. All is now in good working order. The wreckers are at anchor outside the reef, and will probably save the vessel as soon as the gale abates, as she is favorably located.
12.02 p. m.

J. J. GUTHRIE,
Superintendent Life-Saving Service, Sixth District.

19.

CAPE HENRY, VIRGINIA, *March* 24, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

Ship Winchester is lying in same position as yesterday. Wreckers have just succeeded to lay cables, and everything is favorable for speedy work.
9.25 a. m.

STEIN, *Sergeant.*

20.

CAPE HENRY, VIRGINIA, *March* 24, 1877.

S. I. KIMBALL,
In charge of Life-Saving Service, Washington:

Ship Winchester is not in immediate danger. The wreckers have charge of her, and laid out cables for hauling her off, and everything has been done by keeper and surfmen that could be done. No further necessity for me remaining here, everything working favorably, and therefore return to-day.
10 a. m.

J. J. GUTHRIE,
Superintendent Life-Saving Service, Sixth District.

21.

CAPE HENRY, VIRGINIA, *March* 25, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

Ship Winchester remains in favorable position without leaking. Wreckers have laid anchors and cables and have all apparatus aboard. Commence heaving ballast overboard early this morning, and it is expected to get her afloat next spring-tides.
8.15 a. m.

STEIN, *Sergeant.*

22.

CAPE HENRY, VIRGINIA, *March* 26, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

Last night during the prevailing heavy fog another full-rigged ship and two barks went ashore near this station within a mile of each other. Only the ship is within signaling distance, but the weather remains too foggy to obtain particulars at present.
8.15 a. m.

STEIN, *Sergeant.*

23.

CAPE HENRY, VIRGINIA, *March* 26, 1877.

B. & J. BAKER & CO., *Norfolk:*

Another ship and two barks ashore near this station.
No particulars yet.
8.15 a. m.

STEIN, *Sergeant.*

24.

CAPE HENRY, VIRGINIA, *March* 26, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

The main and mizzen masts of the full-rigged ship reported as having run ashore last night near this station have just fallen overboard. My attention-signals have not been answered yet, and crew of life-saving station has not succeeded to board her.
8.45 a. m.

STEIN, *Sergeant.*

25.

CAPE HENRY, VIRGINIA, *March* 26, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

While down the beach, during a break of the thick fog, I succeeded, by means of field-glasses, to make out the name of the unknown ship to be Pantser.
9.26 a. m.

STEIN, *Sergeant.*

26.

CAPE HENRY, VIRGINIA, *March* 26 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

Ship Winchester remains in her favorable position, well upon shore, and no danger is anticipated from the prevailing storm. She does not leak to any extent.
9.28 a. m.

STEIN, *Sergeant.*

27.

CAPE HENRY, VIRGINIA, *March* 26, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

The two barks reported ashore are the Italian bark Franceshino, Capt. G. B. Broglio, and Monte Tabor, Captain Cuneo, both in ballast, consigned to Schiaffino, Baltimore, Md. The ship reported is the Norwegian bark Panteer, also bound in ballast to Baltimore. The wreckers' surf-boat boarded the stranded vessels and sent for the necessary assistance. The crew of life-saving station succeeded in firing line to the Norwegian bark Panteer, but it seems that she does not desire to avail herself of it, as the crew does not haul line in.
10.50 a. m.

STEIN, *Sergeant.*

28.

CAPE HENRY, VIRGINIA, *March* 26, 1877.

B. & J. BAKER & CO., *Norfolk:*

Boarded the two Italian barks Franceshino and Monte Tabor, ashore one mile north of station, both in ballast, consigned to Schiaffino, Baltimore, Md. Also Norwegian bark Panteer, in ballast, bound to Baltimore, ashore opposite station. Advise Schiaffino and send all the assistance you can, anchors, cables, and tugs. Answer at once and let me know if you want any further information.
11.03 a. m.

WHITNEY.

29.

NORFOLK, VA., *March* 26, 1877.

Captain MCDONALD, *Ship Winchester, Cape Henry, Virginia:*

The following telegram was received this morning from Crospaw, addressed to us: "Was Winchester abandoned at any time by captain and crew after accident?" We have replied, "She was not abandoned."
11.20 a. m.

REYNOLD BROTHERS.

30.

WASHINGTON, D. C., *March* 26, 1877.

Sergeant STEIN, *Cape Henry, Virginia:*

Wind will shift to north or northwest strong to-night.
11.45 a. m.

C. E. KILBOURNE.

31.

NORFOLK, VA., *March* 26, 1877.

Captain KUNDSEN, *Norwegian Bark Panteer:*

Do you wish assistance of any kind?

WILLIAM LAMB,
Norwegian Consul.

32.

NORFOLK, VA., *March* 26, 1877.

E. WHITNEY, *Cape Henry:*

Will send assistance at once. Telegraph Schiaffino.
1.25 p. m.

B. & J. BAKER & CO.

33.

NORFOLK, VA., *March* 26, 1877.

Captains of Barks FRANCESHINO and MONTE TABOR,
Cape Henry, Virginia:

We have a telegram from Mr. Schiaffino, saying that he will leave Baltimore to-night for Norfolk to assist you.
2.19 p. m.

REYNOLDS BROTHERS

34.

CAPE HENRY, VIRGINIA, *March* 26, 1877.

REYNOLDS BROTHERS, *Norfolk:*

Ship Winchester remains in favorable position; is heaving ballast overboard at the rate of 100 to 150 tons per day; is not leaking to any extent. No danger anticipated from prevailing bad weather, and will in all probability be got afloat with next spring-tides. Italian bark Monte Tabor got afloat without assistance at three forty-five p. m., and proceeded or her way.

4.25 p. m.

STEIN, *Sergeant.*

35.

CAPE HENRY, VIRGINIA, *March* 26, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

Italian bark Monte Tabor, one of the barks ashore at this station, just got afloat without any assistance, and is proceeding on her way.

4.50 p. m.

STEIN, *Sergeant.*

36.

CAPE HENRY, VIRGINIA, *March* 26, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

After communication was effected by me through means of International Code Signals with the Norwegian bark Pantser, she signaled to send life-boat. I signaled back to haul up line which had been fired by the life-saving crew this morning, and since then the crews of life-saving stations No. 1 and 2 have been at work necessary to run life-car, in which they have just succeeded, and seven of the stranded vessel's crew, which consists of 11 all told, have been rescued. Life-car has gone back to the vessel to bring ashore the remainder. The vessel has been driven upon an old steamboat wreck and a hole was stove in her bottom. She is filling up with water rapidly.

8.40 p. m.

STEIN, *Sergeant.*

37.

CAPE HENRY, VIRGINIA, *March* 26, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

The entire crew of Norwegian bark Pantser have been rescued.

9.08 p. m.

STEIN, *Sergeant.*

38.

CAPE HENRY, VIRGINIA, *March* 27, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

Norwegian bark Pantser in bad condition and full of water. Will in all probability go to pieces.

8.20 a. m.

STEIN, *Sergeant.*

39.

CAPE HENRY, VIRGINIA, *March* 27, 1877.

S. I. KIMBALL,

In Charge of Life-Saving Service, Treasury Department, Washington:

The crew of Norwegian bark Pantser have all been saved by means of the life-car, eleven all told, and everything is working well. One of the Italian barks, Monte Tabor, got afloat without assistance and proceeded on her way, while the other one, the Franceshino, is in no danger. All is working well.

8.25 a. m.

J. J. GUTHRIE,
Superintendent Life-Saving Service, Sixth District.

40.

CAPE HENRY, VIRGINIA, *March* 27, 1877.

E. D. BIGELOW & CO., *Baltimore,* (through Chief Signal-Officer, Washington):

Pantser stranded on Cape Henry. Full of water. Telegraph me what to do. Will probably go to pieces.

8.30 a. m.

JOHANNESSEN, *Master.*

41.

NORFOLK, VA., *March* 27, 1877.

Captain BUGLIONS, *Italian Bark Franceshino:*

Dele prego in guate sicurta, siete e serichiedete mea asseslen za.
8.40 a. m.

SCHIAFFINO.

42.

CAPE HENRY, VIRGINIA, *March* 27, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

Ship Winchester, at last high-water, has been moved about a length. They continue to heave ballast overboard at the rate of 100 to 150 tons per day. Sea and wind very high and unfavorable to speedy work, but ship remains in good condition and position.
9.40 a. m.

STEIN, *Sergeant.*

43.

CAPE HENRY, VIRGINIA, *March* 27, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

I am informed that the bark Franceshino so far declines assistance offered by life-saving crew. There is no immediate danger of loss of life or breaking up of vessel.
11.28 a. m.

STEIN, *Sergeant.*

44.

CAPE HENRY, VIRGINIA, *March* 27, 1877.

S. I. KIMBALL, *In Charge of Life-Saving Service, Washington:*

The Italian bark Franceshino so far declines assistance. No immediate danger of loss of life or breaking up of vessel. Everything working well.
11.30 a. m.

J. J. GUTHRIE,
Superintendent Life-Saving Service, Sixth District.

45.

CAPE HENRY, VIRGINIA, *March* 27, 1877.

B. & J. BAKER & CO., *Norfolk:*

Moved Winchester about 150 feet, and everything is working all right.
11.35 a. m.

WHITNEY.

46.

CAPE HENRY, VIRGINIA, *March* 27, 1877.

Captain JOHANNESSEN, *Norfolk:*

Since your departure your chronometer and many other valuable articles have been saved. The vessel is breaking up. No hope of saving her.
Message from Bigelow at William Lamb's.

J. J. GUTHRIE,
Superintendent Life-Saving Service, Sixth District.

47.

BALTIMORE, *March* 27, 1877.

Captain JOHANNESSEN, *Bark Pantser, Cape Henry, Virginia:*

Recommend you to remain by while there is any chance to save, for all concerned.
1 p. m.

E. D. BIGELOW & CO.

48.

CAPE HENRY, VIRGINIA, *March* 27, 1877.

Captain JOHANNESSEN,
Care of William Lamb, Norwegian Consul, Norfolk, Va.:

Recommend you to remain by while there is any chance to save, for all concerned.
1.20 p. m.

E. D. BIGELOW & CO.

49.

CAPE HENRY, VIRGINIA, *March* 27, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

There is no hope for the Norwegian bark Pantser; she is breaking up rapidly.
2.10 p. m.

STEIN, *Sergeant.*

50.

NORFOLK, VA., *March* 27, 1877.

HORATIO CREEKMAN, *Keeper Cape Henry Light-House:*

It is reported that several vessels are ashore near your station. It is your duty to look out for any cargo that may be landed or drift ashore. If you need any assistance, in such case notify this office and the same will be sent.
2.55 p. m.

JOHN S. BRAXTON, *Collector.*

51.

CAPE HENRY, VA., *March* 28, 1877.

SCHIAFFINO, *Baltimore:*

Sempre Arenato Vento contrario Combiando Vento Spero levorlo Desedero Viderti con Vapore per Vedere il Doforsi Telegrafte.
10.50 a. m.

CUNEO.

52.

CAPE HENRY, VIRGINIA *March* 28, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

The Winchester has been moved considerably last night, and has just signaled to me to have the hawsers on shore "off and on." The life-saving crew have been notified and are complying with the request. The Pantser remains in bad condition, and is expected to go to pieces at any moment. The Italian bark did not answer my signals, but has just sent men ashore. They are unable to speak English, but I can make out that she is the Monte Tabor, instead of the Franceshino, which got afloat day before yesterday. The Monte Tabor is not leaking and no danger is anticipated. Sea is going down and weather favorable. Captain Guthrie desires to have these facts communicated to Mr. Kimball.
11.25 a. m.

STEIN, *Sergeant.*

53.

CAPE HENRY, VIRGINIA, *March* 28, 1877.

SCHIAFFINO, *Baltimore* (through Chief Signal-Officer, Washington):

Italian bark Monte Tabor ashore here. The one reported afloat was the Franceshino
11.40 a. m.

STEIN, *Sergeant.*

54.

CAPE HENRY, VIRGINIA, *March* 28, 1877.

ANTONIO BOZZETTO, *Comogli:*

Monte Tabor Arenato, Cape Henri vento Taversia nore so se lo levererno pin aban dons lutte salois.
12.45 p. m.

CUNEO.

(To be cabled by Reynold Brothers, Norfolk.)

55.

CAPE HENRY, VIRGINIA, *March* 28, 1877.

B. & J. BAKER & CO., *Norfolk:*

Winchester signals as follows: "In want of coal; provisions; steamers, immediately."
1.00 p. m.

STEIN, *Sergeant.*

56.

BALTIMORE, *March* 28, 1877.

Captain CUNEO, *Italian bark Monte Tabor* (care of Baker & Co.):

Dato ordini baker assestervi con vapore parto di nuolo aggi Vederoi domani.
2.05 p. m.

SCHIAFFINO.

57.

CAPE HENRY, VIRGINIA, *March* 28, 1877.

B. & J. BAKER & Co., *Norfolk:*

Have the Nettie here at daylight to-morrow with coal and provisions. They could haul the ship off in two tides. No steamers in sight.
4.50 p. m.

E. M. STODDARD.

58.

NORFOLK, VA., *March* 28, 1877.

Captain GUTHRIE, *Cape Henry, Virginia:*

Did Johannessen save inventory? What is condition of vessel?
5.30 p. m.

WILLIAM LAMB, *Vice-Consul.*

59.

CAPE HENRY, VIRGINIA, *March* 28, 1877.

WILLIAM LAMB, *Norfolk:*

Johannessen saved all ship's papers. Vessel, in my opinion, is a helpless wreck.
5.45 p. m.

J. J. GUTHRIE,
Superintendent Life-Saving Service, Sixth District.

60.

CAPE HENRY, VIRGINIA, *March* 29, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

Winchester's situation favorable, and it is expected to get her afloat within two or three high tides; tugs are in readiness to tow her to Norfolk. The position of Italian bark Monte Tabor is the same, and wreckers have gone to work to lay cables.
The Norwegian bark Pantser has been surveyed and declared to be a total loss.
10.10 a. m.

STEIN, *Sergeant.*

61.

CAPE HENRY, VIRGINIA, *March* 29, 1877.

Colonel LAMB, *Norwegian Vice-Consul, Norfolk:*

Pantser lays on old wreck; will be total loss. Captain will arrange with Bakers to strip her and save all material on percentage. Have not been on board yet; going as soon as crew arrives from station-house.
10.15 a. m.

THOS. CRELLIN.

62.

WASHINGTON, D. C., *March* 29, 1877.

WILLIAM HENELY, *Keeper of Life-Saving Station No.* 1:

Remain with the crew at station until Saturday, April 7, inclusive.
By direction of the Secretary.
11.50 a. m.

S. I. KIMBALL,
In charge Life-Saving Service.

63.

WASHINGTON *March* 29, 1877.

J. J. GUTHRIE, *Cape Henry, Virginia:*

Retain crew at life-saving station No. 1, Cape Henry, Virginia, until 7th of April next, inclusive.
By order.
11.55 a. m.

CHAS. F. CONANT,
Assistant Secretary.

64.

CAPE HENRY, VIRGINIA, *March* 29, 1877.

Colonel LAMB, *Norfolk:*

Captain of Pantser has made contract with Baker to save material at 50 per cent.
12.45 p. m.

THOS. CRELLIN.

65.

CAPE HENRY, VIRGINIA, *March* 29, 1877.

B. & J. BAKER & CO., *Norfolk:*

Pantser condemned; will strip her 50 per cent. salvage; will send Nettie up with crew; will probably leave at three o'clock. Baker relieved Nelson this morning; he expects to get off as soon as wind moderates. Parted cables on ship this morning, but have repaired it. Resolute shifting ship's anchor. Baker will lay cables to Italian bark as soon as wind moderates.
1.05 p. m.

E. M. STODDARD.

66.

CAPE HENRY, VIRGINIA, *March* 29, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

Winchester's position and condition remains favorable. One of the wreckers' tugs is shifting her anchors, and it is expected to get her afloat as soon as the wind, which is blowing at the rate of 32 miles per hour, moderates. The wreckers will strip the Norwegian bark Pantser of her rigging; her crew has been sent to Norfolk to be cared for by their Consul. The Italian bark Monte Tabor remains in same position, and wreckers have got her in charge.
2.20 p. m.

STEIN, *Sergeant.*

67.

CAPE HENRY, VIRGINIA, *March* 30, 1877.

REYNOLD BROTHERS, *Norfolk:*

Winchester afloat; will be towed to Norfolk.
9.08 a. m.

STEIN.

68.

CAPE HENRY, VIRGINIA, *March* 30, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

Winchester got afloat at 9 a. m., and will be towed to Norfolk.
9.15 a. m.

STEIN, *Sergeant.*

69.

CAPE HENRY, VIRGINIA, *March* 30, 1877.

B. & J. BAKER & CO.:

Winchester afloat. Send Nettie to help tow her up. Have contracted with Monte Tabor, and must keep Baker to lay cables and anchors. Wind blowing too hard to work at present.
9.20 a. m.

E. M. STODDARD.

70.

CAPE HENRY, VIRGINIA, *March* 30, 1877.

B. & J. BAKER & CO., *Norfolk:*

Instruct Captain Barney by the Nettie that he must come to bark at once. Baker and Resolute have Winchester in tow.
9.30 a. m.

E. M. STODDARD.

71.

NORFOLK, *March* 30, 1877.

Capt. E. M. STODDARD, *Cape Henry, Virginia:*

Nettie is here all right. Have sent out for Captain Cole, and will send him off at once.
9.50 a. m.

B. & J. BAKER & Co.

72.

BALTIMORE, *March* 30, 1877.

SCHIAFFINO, *Cape Henry, Virginia:*

Have cabled; do best Monte Tabor. Return at once. Rosa V. Marino Dolero Milon, Cuttesina Portia Carlo, Franceshino, and three other vessels in bay. Work sharp.
9.52 a. m.

CASSA.

73.

LEWES, DEL., *March* 30, 1877. (Via Norfolk.)

SCHIAFFINO, *Cape Henry, Virginia:*

Tuo compagno lettra venti sette cunforami prosequore Baltimore assecurami se sta tine telegraphate.
9.55 a. m.

TERRO.

74.

CAPE HENRY, VIRGINIA, *March* 30, 1877.

CHAS. CONANT, *Assistant Secretary of the Treasury:*

Your telegram received and will be complied with.
9.28 a. m.

J. J. GUTHRIE,
Superintendent Life-Saving Service, Sixth District.

75.

CAPE HENRY, VIRGINIA, *March* 30, 1877.

S. I. KIMBALL, *in charge of Life-Saving Service, Washington:*

Winchester afloat this morning, and Monte Tabor all right.
Will return to-day to Portsmouth.
10.30 a. m.

J. J. GUTHRIE,
Superintendent Life-Saving Service, Sixth District.

76.

CAPE HENRY, VIRGINIA, *March* 30, 1877.

Terro, Cap. Ital. b'k Otlone, Lewes, Del. (through Chief Signal Officer, Washington):

Sta bene prosequite Baltimore.

SCHIAFFINO.

77.

CAPE HENRY, VIRGINIA, *March* 30, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

Italian bark Monte Tabor remains in same position without leaking. Wreckers will resume work as soon as wind moderates.
10.45 a. m.

STEIN, *Sergeant.*

78.

CAPE HENRY, VIRGINIA, *March* 30, 1877.

B. & J. BAKER & CO.:

Try to have the Baker here in the morning. Italian growling. Resolute picking up anchors. Want to strip Norwegian before there is bad weather.
5.55 p. m.

E. M. STODDARD.

79.

NORFOLK, *March* 30, 1877.

Capt. E. M. STODDARD, *Cape Henry, Virginia:*

The Baker has gone to Lynnhaven. If schooner don't come off will go to you in the morning. If you want the Nettie to bring more help, telegraph us in the morning.
7.10 p. m.

B. & J. BAKER & CO.

80.

CAPE HENRY, VIRGINIA, *March* 31, 1877.

B. & J. BAKER & CO., *Norfolk:*

Better send Nettie with men and relieve Baker. Expect schooner is afloat. Resolute laying cables. Wind east.
8.34 a. m.

E. M. STODDARD.

81.

CAPE HENRY, VIRGINIA, *March* 31, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

No material change in position or condition of Italian bark Monte Tabor. With a few days good weather, the wreckers expect to get her afloat without much difficulty.
9.15 a. m.

STEIN, *Sergeant.*

82.

CAPE HENRY, VIRGINIA, *April* 1, 1877.

CHIEF SIGNAL-OFFICER, *Washington:*

Italian bark Monte Tabor has been moved 12 feet and remains in good condition.
12.16 p. m.

STEIN, *Sergeant.*

83.

CAPE HENRY, VIRGINIA, *April* 4, 1877.

B. & J. BAKER & CO., *Norfolk:*

Italian bark afloat at high water last night and proceeded on her way to Baltimore in tow of tugs.
8 a. m.

STEIN.

84.

CAPE HENRY, VIRGINIA, *April* 4, 1877.

CHIEF SIGNAL-OFFICER,
Washington:

Italian bark Monte Tabor was got afloat early this morning at high tide, and proceeded on her way to Baltimore in tow of Baker's wrecking-tugs.
8.20 a. m.

STEIN, *Sergeant.*

Very respectfully, your obedient servant,

WM. STEIN,
Sergeant Signal-Service, U. S. A.

CHIEF SIGNAL-OFFICER, U. S. A., *Washington, D. C.*

PAPER 45.

SAINT MICHAEL'S, ALASKA, *June* 20, 1877.

SIR: This final report, which I have the honor to submit, is intended to convey a general description of the principal features incident to this area. Though imperfect as the knowledge is, and recognizing the necessity of carefulness, I shall endeavor to present only facts, and leave the more important deductions to be made by those more competent to undertake the task.

The system of observations undertaken by me should not be considered perfect, as I have, in a great measure, relied upon my own tact, through an inability to obtain the much-desired instruction and advice from the proper authority from the first to the last of my three years' stay at this place.

ATMOSPHERIC PRESSURE.

The variability of pressure at all seasons, depending as it does on the influence of locality, is sometimes greatly extended, so that a considerable district is included in the area of low pressure in summer and generally local in winter, while the area of high is usually more restricted. The fluctuations of the barometric column are great. Usually a low barometer is preceded by a high range, and *vice versa*.

The oscillations, considered for a season, are much greater in winter than in summer. At times the fall is regularly graduated, and at others rapid in extreme, while opposed to this the column is sometimes very sluggish, scarcely moving for the entire day. In the winter-oscillations a rise or fall of seventy-five hundredths of an inch is recorded several times.

The average low winter pressure will be found to result more from the quick succes-

sion of storms than from any other cause. Wave after water of cold, each succeeded by one of warmer, will keep the column in a state of continual oscillation. The fall is usually more noticeable and extended in winter from a storm from the north or northeast than from any neighboring effect of heat.

The oscillations during a storm correspond to the variable force of the wind, and usually coexistent with the greatest force of the wind.

The extreme height of the barometer is usual in November upon the setting in of winter, reading 30.960; a corresponding low from the increasing heat of summer in May, reading 28.701. A continued maximum, when the barometer reads above 30.00, is of frequent occurrence in all seasons of the year. A corresponding low prevails to a less degree. Often periods not controlled by other than local influences show that the rain-fall begins at one-tenth of an inch below an assumed mean of 29.700, and the column wavers upward immediately on the fall of the first few drops.

TEMPERATURE.

The range of temperature, covering the extremes of 75° in June and —50° in February, is extremely variable for each month, and this for the different years is variable.

Starting from April, we find the mean monthly heat increases almost uniformly to a maximum of 55°.355 for July and 52°.996 for August, then as steadily declines during the fall and winter months, usually reaching its minimum mean in February or March.

The minimum may occur in either of these months. During the winter the temperature is subject to a greater range for each month than in summer. In January, a range of 80° has been recorded as the extremes for a month, and in July a range of 32° was the greatest. Ranges nearly as great as the former may occur at irregular periods during the winter. The least variation between the extreme means for any two days in a month is found usually in August, when 8°.5 is read, while the greatest variation between the extreme means for any two days in a month is found in January, giving a reading of 50°.75. The greatest monthly variation is found in July, with the mean of 55°.355, and February having a mean of — 23°.8, making a difference for the extremes for the months of 79°.155. That this latter is exceptional will be seen from the appended summary.

The least daily variation, as derived from the maximum and minimum thermometers, shows only 2°.5, while four to five degrees is common.

HUMIDITY.

The prevailing high humidness of the air in this locality shows considerable variance between the winter and summer; in the latter reading occasionally as low as 40 per cent., and usually at 70 per cent. reaches its maximum extended period in winter, where for months the record of saturation is not broken. This is further proven by the fact that a piece of ice half an inch in thickness will be two months clinging to an erect pole. The least amount of vapor in the air is recorded from 11 a. m. to 3 p. m., or corresponding to the maximum heat for the day.

This is, I believe, somewhat at variance from the usually assumed rule.

The humidity of the various surface-currents, also, presents great differences. The northeast current contains least humdity, though this wind, being the most frequent, presents many irregularities.

Following the card of winds to south, the humidity increases, while south-southwest diminishes to a slight degree. From north back to southwest the humidity increases. Of all the winds, the southwest contains the greatest amount of moisture, and is sure to result in rain or fog in summer, if the wind should back. To this the month of June, 1877, presented some exceptions.

The wind blew from the southwest during the night, laden with moisture, and backing the following morning to north or northeast (a warmer wind), brought on fog as a thin stratum, though not at any time as it was in former years.

RAIN.

Usually begins with low, foggy clouds, precipitating small drops, and generally increasing in size to the middle of the shower, then decrease to taper off a longer time than beginning. Mists to moderate is the usual character of the showers. Hard dashes seldom occur, and then never with that violence that seems to fall on the mainland but few miles distant, or in warmer countries. Shower after shower hangs in the neighborhood, rarely approaching within two or three miles, and carried to either side, generally to the west. Thunder and lightning seldom accompany these showers. Only once has a shower, accompanied by vivid lightning and loud thunder, passed overhead, and then rivaled a thunder-storm of the Middle States. Thunder is sometimes heard in the neighborhood, though not more than three or four times on an average in

a year. Lightning is yet rarer. The greatest amount of rain usually falls in August, and for any one day the greatest recorded depth is .83 inch, while showers are frequent that give .1 to .3 inch.

Rain occurs every December upon the winter solstice. The exposed thermometer has read 24 degrees, while rain during this period occurred.

Hail from a heavy cumulo-stratus cloud has twice fallen, and was restricted to an area of probably less than three square miles. No visible electric display accompanied these falls. The latest rains that fall are frozen the instant they touch the earth, these occurring in October or November.

I have thought that it is probably a provision of nature to overload the weeds and grasses to break them to the ground, that the seeds may be more protected from cold by the approaching winter's snow.

SNOW

usually falls in moderate quantities. A depth of over a foot has occurred but twice in three years. A hard wind generally accompanies the storm so that it is usually drifted the instant it touches the ground. It may fall in any month but July.

Once the old and new snow met. Varied forms of flakes are met, but usually the compound flakes are precipitated upon a high temperature, while the smaller kinds fall during cold. Often fine flour-like particles are rifted from a thin veil of cirro-stratus and thin stratus; this rarely exceeds one-tenth of an inch in depth. During clear weather frost-crystals rift from the sky and can only be recognized by looking over the top of a building while the comb of the roof hides the sun. It is probable that the greater part of these frost films do not reach the ground, as all my endeavors to collect them on black paper in a situation well guarded against currents of air were fruitless. Sometimes when a crust is formed on the snow, the heat absorbed into the earth, through the snow, liberates vapor, which, emerging through the snow, is crystalized in long spiculæ like a forest of feathers, miniature ferns, and palm-leaves.

In February, 1875, I noticed a V-shaped halo on the ice below me, and extending a great distance, regularly diverging with the apex toward me. I now venture to suggest that these frost-crystals on the ice might produce such refraction and reflection.

Frost spiculæ attain a length of two inches during a temperature between zero and melting-point of ice and a light southwest wind. These grow on all objects, though on posts, palings, feathers and hairs, the most beautiful needles are formed. They are generally broken off by a succeeding wind.

The results obtained from measurements of snow have been very much less than the actual amount. No sooner does a snow begin to fall than a wind will drift it into the sea or interior. The annual fall is probably not one-half so great on this part of the coast as it is in the interior but few miles.

I estimate that only about three-fifths of the true amount has been recorded, so deficient have been the snow measurements. It has a range of seventy degrees of temperature for falling. Large flakes, almost snow-balls, have fallen when the exposed thermometer read 40°, and the lowest has been — 30°.

The greater amount of snow falls in March, and as this month is the windiest it is very evident that the foregoing statement could be correct. I estimate, roughly of course, that the snow-fall of winter is fully one-third greater than the rain-fall for summer.

DEW.

is not often noticed, probably from the fact of the short nights during the period that dew should fall. It is most often noticed in August and September—sometimes forming copiously.

FOG.

Fog is rare in winter and more common in summer—as often the result of the low descent of clouds as to the effect of the intermingling of two currents of air having different temperatures. Fog-patches are often seen on the low grounds. A general fog attends the breaking up of the ice in spring, and is said to be an index to the breaking up of the ice in the Yukon River. On two occasions this has been verified.

The fog-cloud seldom lasts longer than a day, still more often for only a few hours, though intervals of more or less density have prevailed for two or three days. A wind backing to the southwest after a warm spell, usually produces the most persistent *fog*.

CLOUDS.

Situated as this part of the country is, and partaking the nature of both a marine and continental climate, the amount of cloudiness is not so great after taking an extended period into consideration.

The proportion of cloudiness is taken at 2 p. m.; about equal to the amount of clear and fair days taken at the same hour of the day.

From June to November the amount of entire cloudiness consumes about two-thirds of the time.

From November to March the number of clear days equal at least those of cloudy, while fair days are proportionate equally to either.

The ratio of clear to cloudy is one to three, while fair stands two to three. To be plainer, one day in six is clear; two fair and three cloudy when taken for an extended period.

The greatest number of clear days occur in November and February; the latter somewhat in excess of the former month.

STRATUS.

In the Form 4, I have divided the stratus according to its apparent height by a qualifying word.

This cloud, usually low or at a medium height, presents its characteristic color. Variability of color is entered on Form 4.

Sometimes in moderate weather the color assumes the deepest blue-black, having this color more intensely than in any other form of cloud.

Stratus prevails to a greater extent than any other cloud, often continuing for nearly a month at a time. Stratus and nimbus are so intimately related that to separate them would add confusion, and I have used the term nimbus for an actual raining-cloud. From these two kinds the greater part of the precipitation falls, excepting the finest particles of snow.

CUMULO-STRATUS,

attendant upon the warmest days of summer, is the most prevalent cloud during that season, and attains the magnitude it does in warmer latitudes. Far in the edge of the east or south horizon, several small, firmly-outlined clouds will expand to overspread the greater part of the heavens by 2 p. m., and from these the most copious showers of rain fall. The height of this cloud is from two thousand feet to about two miles, usually of blue color and white edges.

CUMULUS.

Cumuli are classed as belonging to the lower system of clouds, and rarely present any other appearance than extraordinary cumulo-stratus. But few distinctions have been made in the daily journal between these two clouds.

True cumuli rarely approach nearer than six to ten miles, and more often the heads of the clouds are but little raised above the horizon. These clouds are principally formed in the S. E. and W. S. W.

I noticed rain to pour from one of these clouds in June, 1875, for several hours on the main-land, about twenty miles distant, and accompanied by thunder and lightning.

The usual color is dark blue to bright indigo, and occasionally silver-edged.

CIRRO-STRATUS

is not of tenobserved, and is usually the result of rapidly descending cirri. Stratus and cirro-stratus are, at times, scarcely distinguishable. Snow in finest, round, firm rifts form this cloud in winter. The usual color is grayish.

PAL. CIRRUS.

This cloud forms itself in such an incredible short time as to give but little time for its study; it disappears as suddenly. Usually perfect, and really an exaggerated form of low globular cirro-cumulus, rarely moves from any other point than north or south, and is almost certain to result in snow. It seldom remains longer than three hours, and but once hung for three days, this seldom attaining sufficient density to veil the sun, and presents that singular phenomenon of sunshine and clouds. It has a pale-blue rounded form and white-edged, seemingly in a state of repulsion.

CIRRO-CUMULI.

The prevailing forms of this cloud are the apparent converging bands, often of the greatest delicacy of texture.

On one occasion, eleven perfect bands were seen, and four to seven being common. These bands usually extend due east and west, moving from south, rarely from north: and northwest and southeast, moving from northwest, rarer still north and south.

moving from either point, though more frequently from south; and southwest and northeast, from either point, though most frequently from northeast.

These bands most often extending east and west is probably due to the indrawing effect of the ascending and descending currents near this latitude.

Broken bands and irregular forms are common. One of these irregular forms is like a wall of masonry with the mortar left out, and, if in the east or west near the time of sunrise or sunset, it is most beautifully tinted with a rather deep pink, forming a splendid spectacle.

The cirro-cumulus cloud has a great range through the atmosphere of probably one to four miles. Their color is usually pale pearly-blue to white.

CIRRI.

The prevailing forms of this cloud are pencil-streaks and whirls. Many modifications occur, which bring the cirri and cirro cumulus in such close relationship that it is often a matter of nice discrimination to separate them. In this condition they are recorded as intermixed. This condition may continue for several days with not another cloud to be seen, and calm to gentle surface-currents, while the two clouds are being rapidly hurled from north to south, or, more commonly, *vice versa*.

Above this intermixture and the upper limits of the cirri are multitudinous modifications of the primary cirri. Among these the principal varieties are jelly-fish (usually head to the wind), horsetails (rare), wisps, plumes, and filopplumaceous curls, pectinacious and doubly pectinate; forms like the blur of a moderately-stretched cord having locks of loose cotton closely arranged on it and the string put in motion with a twang of the finger. This appears to be the pencil and curl cloud interformed.

Many other varieties, such as the fancy can suggest, are also seen. The cirro-cumuli and cirri in this latitude present such attractive forms that the pen cannot describe and only the most skillful brush portray.

Pale, scarcely-distinguishable cirri rapidly form the frayed curl cloud, descend through the cirro-cumulus region, seem to miss the cirro-stratus, and form stratus in such a short time that it is hardly credible. Rain in summer or snow in winter is sure to result from this rapid descent.

SUNSET SHADOWS

are rarely seen, and rarer perfect. On one occasion eleven perfect bands or fingers were seen to point to the zenith when the sun was within two degrees of setting.

CLEAR WEATHER.

The sky is often clear of clouds for days at a time, especially in the months of November and February; clear days occur rarely in the summer, and are then pleasant in the extreme.

On the Form 4, I have entered only absolutely clear as clear, or with such few exceptions as will readily show themselves.

WINDS.

In the earlier months of my stay at this station I recorded the winds in their subdivisions of the eight principal points of the compass, but later I have disregarded this on account of the extreme unsteadiness of all winds.

The oscillations of the vane are extremely rapid, and covering on one occasion a range of 180°, while the usual swing is fifteen to eighty degrees, forty-five being common, steadiness of the vane being very rare, and then only in light to fresh winds.

SURFACE-CURRENTS.

North wind.—This wind prevailing in the southwest and westerly quadrants of storms, has a general tendency to veer, and often, by its extreme unsteadiness, oscillates from north 18° west to north-northeast, or even to east-northeast. It blows for days together without a sign of cloud. Its velocity is extremely variable, from light to a terrific hurricane.

In October it blows for weeks at a rate of from fifteen to seventy miles per hour; while for the other seasons its average rate is about thirty-four miles. During the prevalence of this wind fair or clear weather obtains. This wind is taken as the standard for relative frequency, and will be considered as the unit of ratio.

The temperature of this wind is low.

Northeast wind.—The northeast current so nearly resembles that of the north that to separate them is more convenient than advisable. The oscillations of the vane during

high winds from this point cover two-thirds of the oscillations for the north wind, besides having its own tendency to eastward. Its velocity is usually about thirty-one miles, and ranges from light to highest storm-rate.

This wind is the most frequent, and has the ratio of two to one of the north wind. Its temperature is higher than that of the north wind.

East wind.—A due east wind seldom prevails, as it has an east-northeast or east-southeast tendency. It seldom lasts longer than one day, and usually for only a few hours, as it is in general only blowing during the passage of northeast to south. Its velocity is high, about twenty-eight miles per hour, and on two occasions has exerted itself to a hurricane-rate, once of eighty-six miles, and at another time of highest storm-rate. Its temperature is warm, generally pleasant.

It has the ratio of five-tenths to that of the north wind.

Southeast wind.—The wind prevails from this point so seldom, and often in the relapse of the north quadrant of storms, or else when the northeast wind is veering to south for a long period.

This is the warmest of all the winds, and raises the temperature many degrees in spring, at the season when this wind occurs most often, and attaining its greatest violence, sometimes that of a hurricane-rate to that of highest gale. It is intimately connected with the south wind.

Exceptions hold this wind for thirty hours, but the average duration is not longer than five hours with an average rate of thirty-five miles, always having a tendency to veer. It has a ratio of .25 to north wind.

South wind.—The surface current from this point is the most frequent of the southerly winds. It is the great current pushing toward all the storm centers of Northern Alaska. For days in winter, and longer in summer, it will hurl masses of air at least a mile deep, and often four miles deep northward, at a rate of fifty miles per hour, and for hours asserts its terrific hurricane strength of eighty-five to over a hundred miles per hour. A short lull usually occurs in the center of these storms. The vane is comparatively steady, considered for hours, but has sometimes a backing or veering tendency, or even both, of twenty or twenty-five degrees on either side of south.

To this wind we owe our very existence, in this country. By its power the ice is forced through the straits. The tides caused by this wind raise up and break the otherwise firmly bound shore ice. Our annual supply of wood is thrown on shore by this wind and its accompanying tides.

The temperature of this wind is higher than any other wind, excepting the southeast. It has about the same frequency as the north wind.

Southwest wind.—This wind occurring so frequently, and usually the resting point for backing winds from the northeast, has a ratio of four-fifths to one, of the north wind for frequency. Being most often the result of a backing wind, it has the effect to reduce the temperature fifteen to twenty degrees. By its low temperature it causes the greater amount of fog at this place. It always has a tendency to veer, rarely backs, and especially to veer if the wind should *back* to this point. Its rate is usually thirty miles per hour, and very seldom blows over fifty miles per hour.

West wind.—This wind usually prevailing in that quarter only temporarily, and from a backing wind, has an effect to lower the temperature, but if veering, to raise it. This wind, usually fresh to brisk, has but once reached a gale rate of fifty-five miles per hour. It has a ratio of .25 to one of the north wind.

Northwest wind.—This is intimately connected with the west wind, and like it, usually temporary in that point for only a short time, and usually the result of backing. Its temperature is low. Its ratio to the north wind is as one-fifth to one.

The rate of the wind is inconsiderable, seldom over a brisk rate, and its highest recorded velocity is forty-eight miles an hour.

That the west and northwest winds should occur most frequently, I am led to infer from the fact that during the winter of my first year at this station, a delegate was sent from the neighboring native village to request me to turn the dial of the anemometer so that it should face the west, as it faced east-northeast, as the reindeer, in moving go against the wind, and that would bring them to this part of the coast.

After some parley, I convinced the native that the machine did not make the wind. I never heard anything more about it.

GENERAL REMARKS CONCERNING THE WIND.

The intermediate winds have been left out, and included in the remarks for the eight principal points. A few remarks concerning the surface winds will not be out of place.

The effect of backing, if on the west side, is to lower the temperature; hence to veer on that side is to raise the temperature.

To veer on the east side is to raise the temperature; to back is to lower the temperature. The ratio or frequency of veering or backing is greater for the latter. A view of the "summary" will show the number of times of frequency from all recorded points of the winds.

Upper currents.—Of these, there are four, of which the one from the south is the most frequent, and probably equal to that of all others. The north current is the next most frequent; then is followed by one from southeast, and one from northwest, the former in excess of the latter for number of times.

At times, streams of upper clouds are carried from south for days and even weeks at a time; even if the lower sky should be clouded for a time during this period, I have reason to believe that the upper current has not been interrupted.

During my latter days I began to foretell changes of wind on the surface from north to south by these upper clouds moving from north. It has but rarely failed unless the whole mass of the atmosphere was to move from the south.

TIDES.

Tides forming a part of my regular observations, demand attention. The observations have been most of the time without a proper gauge, as the bottom in the arm of the sea here consists of fine volcanic gravel and ashes which make a very unstable foundation for a gauge. The high waves have carried out three gauges, hence I have adopted permanent stones and rocks for the necessary measurements.

The effect of the attraction of the sun and moon on the water in Norton Sound is to raise a tidal wave of about two and a half feet in height. This is proven during periods of comparative quiet, when the winds are at rest.

The winds having a much greater effect, will be considered next.

Starting from the north and northeast, the effect of brisk to high winds continued for two days, is to lower the water of this part of the sound about one foot and a half, and continues in this proportion for each day of winds from those points, though a northeast wind is more effective than a north wind, as will be seen from the trend of the coast, and the low pressure to the westward.

The east wind occurring but seldom, and never so vigorous as to produce any appreciable effect, is left out of the question.

The northeast wind, holding for two days, by its southward tendency always raises a tide four to six feet above mean. This extreme tide occurs usually in the months of May and September. The south wind exerts the greatest force, and raises the tidal wave to the extreme of six to seven feet above mean tide.

The hard storm attendant upon the winter solstice produces annually an extreme tide of seven to eight feet. This, and the southeast wind are the opposite in power to the north and northeast.

The north wind in the month of October, acquiring a high storm velocity, and lasting for many days together, throws seven to eight feet of water out of Norton Sound.

The shallowness of the three-fathom curve, bounding this part of the coast, and the low tide, would render it very unsafe for any craft to be inside.

The beach around the island, facing the sea, is narrow, only a few feet, and composed of fine volcanic sand, the remains of the solitary basalt-rock which forms the foundation of all this part of the coast, and, from its extreme hardness, is well termed iron-bound.

When I first came here I made notice of certain unchangeable places on the beach, and these are now eighteen inches above the level taken at that time.

American traders who have been here ever since the occupation of the territory, concur with me in the statement, *i. e.*, that the coast is rising. The natives inform me that many years ago an earthquake occurred in this locality, and raised the coast several feet in the neighborhood of Kegikhtouk, a village about eighteen miles east of this place. The fierce beating of the north and northeast winds in October throws huge winnows of sand on the beach, and are not conformed into the general level until the following spring.

It is rare that more than one tide occurs in a day, and in those times is what is termed a long and a short tide.

The usual time of high water occurs fifty minutes later each day, though there are so many exceptions that it cannot be given as a rule.

For several days the rising of the tide is shortened in time, and floods at nearly the same hour for several days. No positive rules can be laid down by me on the tides.

RAINBOW.

This spectacle occurs seldom, by reason of the entire cloudiness during rain. In summer the bow is sometimes complete, and does not differ from those in lower latitudes. In winter an arc of ten to twenty degrees will sometimes be seen, and on one occasion, when only a slight rift toward the sun made opposite to it a rainbow whose length was scarcely half its width.

In November, 1874, an arc of fifteen degrees height was seen, and besides the primary bow there were three supernumerary bows of variable colors, as given in the journal for that day.

I can conceive of no more beautiful object in nature than this spectacle so brightly displayed against a sky of leaden hue.

The fog-bow is sometimes seen during the day, and, on several occasions, after night. Only once, and then after night, did it incline toward prismatic coloration, and that of faintest red.

CORONÆ.

Coronæ have never been seen, excepting surrounding the moon. A white mass of stratus in winter, if not of too great density, produces this phenomenon in its greatest brilliancy. The different rings are of variable width.

HALOS.

I shall divide the halos into three classes, according to intensity, or absence of coloration.

A pure white halo of 22° often occurs during a time of clear upper sky and the lower atmosphere filled with finest frozen fog-like particles. It is probably due to the smallness of these particles that the halo is colorless, for the same reason that a fog-bow should be white.

A second kind of halo occurs frequently, which I have recorded on the form 4 as a dark halo of 22°. It usually occurs during a very dense streaked cirri vail, and increases to such density as to obscure the sun.

In my earlier days I have frequently noticed that if a piece of perfectly clear ice is held at a certain angle, and looking through the ice edgewise, it appears black. I now venture to suggest that the films of ice in the atmosphere are descending at this angle, and hence the halo appears dark. The inner edge of the ring is usually whitish, but the line dividing the black and white circles is very apparent to an observer.

This halo and the first mentioned halo are always without parhelia or contact arches.

The third class comprises all the halos that exhibit prismatic colors.

The sun during the season for this phenomenon does not rise sufficiently above the horizon to permit an entire halo of 22° to be observed, but it has frequently descended to the ground and not distant half a mile; and was one time, as previously referred to, seen on the ice as a diverging angle. The halo of 45° has been recorded several times. These two alone present coloration, oftentimes very brilliant, but always less so on the one of 45° than on the one of 22°. The parhelic circle has been seen complete on two occasions, and always white.

Parhelia at the intersection of the two halos are common enough; often the tail is prolonged to several degrees. The coloration of these is extremely bright, and sometimes so brilliant as to dazzle the eyes like the sun. The contact arch is seen only above the sun for reasons stated before.

These are more noticeable during the descent of frost films, and are best observed by looking over the top of a building to hide the sun.

The "horns" are fully developed, with the lenticular space well preserved. They exhibit pale, prismatic colors, most often red. Vertical beams are sometimes noticed, but they rarely intersect the halo of 22°. They are more often five to eight degrees above and below the sun or moon. Like the parhelic circle, they contain no trace of coloration. The anthelion is seen only with the parhelic circle complete.

In March, 1875, traces of parhelia, on the parhelic circle, indicated the presence of the halo of 90° rapius. In May, 1877, it was more plainly seen.

MIRAGE.

I have divided this phenomenon into two kinds in the remarks on form 4, viz, vertical and horizontal, or lateral, the vertical mirage being the commoner of the two.

During the moderately fresh winds, or seasons of calm in winter on clear days, this kind of mirage is seen. It lasts with varying intensity for the entire day, often extending along the coast for miles. The horizontal mirage is less common and usually weak. Occasionally the high hill-tops, off thirty or forty miles, are thrown into the greatest confusion, or else extended laterally over a considerable area, or distorted and broken.

This kind of mirage seldom lasts more than half an hour after the sun has risen, and is the most intense about half an hour before sunrise.

The rapidity of motion is greater in the lateral than in the vertical kind. The low coast and absence of trees and bare rocks on the hill-sides do not allow of very much variety in either kind of mirage.

TWILIGHT CURVES.

Twilight curves may be seen at any time after sunset or before sunrise, during clear weather. Their occurrence being as certain as the setting of the sun, I have kept no record of them except in the daily journal, and there, have merely alluded to them as having occurred during the period referred to.

ELECTRICITY.

Electricity has shown itself to be very abundant during the periods of great cold in winter. Having no special instruments to determine intensity of kind, I shall confine my remarks to those occasions when it was developed by friction of the hand on the fur of a dead animal.

A couple of fœtal seals had been stuffed with straw, and as my hand was stroking them one evening in the dark I noticed sheets of electricity to follow the hand, accompanied by the characteristic crackling. I then tried an India-rubber comb on my dry head, and found that very considerable sparks could be drawn out.

At another time I had occasion to tear a piece of muslin that had been washed, and, being where the temperature was at least—16° Fah., I found that by simply tearing the cloth a streak of light much like that produced by drawing a match across the moist palm of the hand in the dark could be plainly seen. I repeated the experiment several times, and extended it to stiff manila paper, and with the same results.

I requested Mr. Neuman, agent of the Alaska Commercial Company, to try the experiment, and some time afterward he assured me of his success in producing the same results.

In fact, the air seems to be filled with electricity during the above-mentioned periods. This naturally brings me to the magnetic variation of this place.

I placed the compass carefully on a board constructed to point due north, and for months at a time I have never seen a tenth of a degree variation of the needle from 23° E., not even a tremor being observed during an auroral display. This 22°(?) variation is exactly what Capt. E. E. Smith, of the schooner Eustace, informed me had been before determined. The authority for this is unknown.

AURORAS.

The auroral displays seen at this station naturally divide themselves into two classes, according to their intensity.

The first of these is what I have described as an auroral haze. It has very slight intensity, no particular form, seldom lasts long, and more seldom recurs. This is the most common display recorded.

The second class will embrace all other kinds, with their variableness of intensity and form. Rarely an arch forms itself unless preceded by the first class as a haze.

This second class to be produced, the haze gathers into a pale narrow arch of variable height, usually at 20° altitude, increases in brightness by nine o'clock, and then forms a second arch above, at a distance varying from five to twenty degrees, and rarely more than six to ten degrees wide. Three or more arches are rare. The single-arched variety has its eastern and western ends incurved at times. Also the eastern end is often broken into a sheet, or patches irregularly scattered, but in the maximum intensity they are absorbed into the arch. Beams, waves, streamers, folds, and other fantastic perturbations attend a brilliant display. These beams move east to west, or *vice versa*, on the arch with a frightful velocity. Sometimes beams move from east to west, while others from west to east are being translated with the same rapidity.

No clash or interference is observable. These pulsations sometimes travel the entire length of the visible length of the arch in less than two minutes, and once in less than one minute. The highest grades of auroras seldom occur over this locality. The corona has been but once perfectly developed. The width of beams, arches, &c., are variable, as is also the length of the streamers. The usual color is pale straw to sulphur-yellow. Other colors have never but twice been observed. Recurring fits are but differences of intensity, and may be said to attend all the displays excepting those of the first class. The dark segment, when present, is usually sharply defined.

The frequency of auroras at this station is somewhat less than is assumed for the latitude of 64° north, and is probably due to the prevalence of clouds during the months of greatest frequency. For four months, May, June, July, August, and a part of September, auroras are not observable at all from the twilight. March and February show the greatest number of displays, and for the entire year about thirty-two auroras are recorded.

GEOGRAPHICAL FEATURES.

An examination of a chart of Norton Sound will show the trend of the eastern shore of the sound to be northeast and southwest in general terms, while to the northward of the sound it is east and west, with very few great indentations along any part of the entire coast from the Yukon Delta to Cape Prince of Wales, excepting Golovin Sound, Norton Bay, and Capes Darby and Romanzoff. The coast is low, generally, on the eastern boundary of the sound, rising gradually to a height of one to two hundred feet, to form low, broken ranges of hills, varying one half a mile to thirty miles from the coast; none of these hill-ranges exceeding eight hundred to twelve hundred feet high. Beyond these coast-hills others, somewhat higher, rise, separated from each other

by a low valley of four to twenty miles wide, having a trend corresponding to that of the coast-line.

The character of the soil varies with the locality. In this vicinity we find a low rolling country, abounding with marshy plains and a few isolated peaks or broken hill-ranges.

The superincumbent soil is composed of volcanic remains, having few small beds of exceedingly tenacious clay in it. All the country, even the low hill-tops, is covered with moss, and, in the extremely depressed portions sphagnum moss is found.

The soil is usually found frozen at a depth of two and a half feet in better than ordinary situations, and in those less favored it is frozen to a depth of twenty or more feet.

In November, 1874, I found, by actual excavation, that the ground in a spot well exposed to drainage was thawed out only two and a half feet from the surface, and in other localities much less.

Though on the hill sides, having a southern exposure, the depth of free soil is in some instances more than ten feet, I am informed by traders that in some places in the interior the frozen soil is entirely thawed out in summer.

Drainage being defective is the cause of the constant frozen ground. Water remains in certain pools for ages. These pools, ponds, even lakes, are being constantly encroached upon by a species of grass, which, by its matting roots, slowly contracts the margin of the pond, and in ages form a perfect non-conducting mat of grass roots *on* the water. This in time being covered by a sphagnum growth, and its consequent coldness by retention of moisture, would form in time a lake of ice beneath the ground, and would only be thawed out by proper drainage.

Another fact that may influence the speedy freezing and consequent non-thawing of these overgrown lakes is that the annual snow-fall is probably one-third or even one-half less than in the interior but few miles distant.

The greater part of this snow being drifted immediately either into the sea or into the interior, it is rare that a depth of over eighteen inches of snow is found on an average. Scarcely a day from November to April but snow is drifted.

I am, sir, your obedient servant,

LUCIEN M. TURNER,
Private, Signal Service, U. S. A.

CHIEF SIGNAL-OFFICER, U. S. A.,
Washington, D. C.

Meteorological summary, Saint Michael's, Alaska, from July, 1874, to June, 1877 (both inclusive).

	1874.						1875.											
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Highest temperature	70	67	56	45	42	38	35	38	30	39	42	64	70	64	56	54	24	29
Lowest temperature	38	38	23	13	1	− 9	−37	−25	−36	−23	15	29	39	38	34	17	−17	−32
Highest daily mean	61.25	59.5	52.25	38.5	38	28.5	31.5	34.6	26	32.25	35	51.75	63.75	53.875	50.75	49	20.25	22.25
Lowest daily mean	48	47.5	29.75	22.25	7.5	0	−22.75	−7.25	−21	− 7	25.25	36.5	48	44.2	42.5	22.75	1.25	−20.6
Days on which precipitation occurred	11	13	4	8	4	8	3	11	7	2	7	6	9	14	11	7	3	2
Amount of snow and rain water	1.18	2.07	.79	2.06	.78	2.03	.22	.09	Unk'n.	.03	.31	.67	1.45	2.205	2.00	.22	.195	.57
Number of clear days	0	1	5	2	8	5	2	4	5	9	1	0	2	0	0	5	7	9
Number of cloudy days	19	22	11	24	15	15	17	13	10	10	17	18	18	21	17	19	12	14
Number of fair days	12	8	14	5	7	11	12	11	16	11	13	12	11	10	13	7	11	8
Number of auroras	0	0	2	2	2	6	1	4	10	3	0	0	0	0	1	5	7	12
Prevailing direction of wind	S.	N. E.	N. E.	N. E.	N. E.	N. E.	N. E.	N. E.	N. E.	N. E.	N. E.	N. E.	N.	S. W.	S. W.	N. E.	N. E.	S. W.
Number of miles traveled	674.6	9004.7	9490.8	11837.5	12263.5	14182.6	15797.6	16334.7	18416.0	15487.3	13797.3	13397.4	14433.6	14827.5	12503.0	16511.0	7949.9	9567.7
Hourly velocity	13	12.1	13.2	16	17	19	24.1	24.3	24.8	21.4	18.6	18.6	19.4	20.0	17.4	22.2	11.0	12.8
Highest velocity for the month	55	47	43	87	88	89	73	68	76	84	76	67	74	81	63	76	87	73
Mean temperature	52.685	52.996	42.875	28.367	20.325	16.908	17.100	20.384	0.600	12.347	30.482	44.807	55.355	50.704	45.546	35.419	7.983	0.692

Meteorological summary, Saint Michael's, Alaska, from July, 1874, to June, 1877 (both inclusive)—Continued.

	1876.												1877.					
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.
Highest temperature	34	17	34	41	54	75	68	64	59	43	36	36	41	12	38	43	57	70
Lowest temperature	−28	−40	−28.5	−17	2	28	39	34	31	8	−24	−25	−39	−50	−16	− 3	16	36
Highest daily mean	29.25	15.25	27	34.5	42.4	61	58.25	57	53	40.25	33.75	27.5	38	5.75	34.75	38.75	50.75	63.1
Lowest daily mean	−17.9	−26	−16.25	− 3	20.6	40.75	45.62	43	34.25	10.6	−16.75	−16.6	−39	−45	− 4.1	8.25	24.4	40.4
Days on which precipitation occurred	5	1	7	7	6	10	10	15	17	12	9	8	10	4	3	8	8	4
Amount of snow and rain water	.33	Unk'n.	Unk'n.	1.58	Unk'n.	1.23	1.81	3.13	3.24	1.67	.33	.10	.93	Unk'n.	.27	.42	.39	1.08
Number of clear days	6	20	8	8	1	2	3	3	0	1	12	2	4	19	12	5	0	3
Number of cloudy days	15	6	15	13	16	16	23	19	27	27	15	21	18	6	8	15	20	10
Number of fair days	10	3	8	9	14	12	5	9	3	3	3	8	9	3	11	10	11	17
Number of auroras	7	8	4	0	0	0	0	0	2	2	7	1	2	11	7	3	0	0
Prevailing direction of wind	S.	N. E.	N.	N. E.	N. E.	N. E.	S.	N.	S.	N.	N.	N. E.	S.	N.	N. E.	N. E.	N. E.	N.
Number of miles traveled	16298.1	7155.5	11396.5	8477.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hourly velocity	21.9	10.2	15.2	11.8	.....	.....	17.5	11.8	10.5	23	9	26	19	6.5	9	17.3	22	17
Highest velocity for the month	66	58	68	48	53†	55†	85†	58	57	63	61	58	94	82	58	64	75	68
Mean temperature	8.940	9.265	7.050	15.660	.....	45.700	52.750	49.240	44.440	30.300	6.900	3.366	1.630	−23.8	19.700	28.800	37.400	52.170

Total number of winds from each point for the thirty-six months ending June 30, 1877, excepting May, 1876.

N.	S.	E.	W.	N. E.	S. W.	S. E.	N. W.	N. N. E.	N. N. W.	S. S. W.	S. S. E.	E. S. E.	W. N. W.	E. N. E.	Calm.
1182	1094	489	271	2058	.....	321	197	21	5	8	9	9	1	10	465

LUCIEN M. TURNER,
Private, Signal Service, U. S. A.

PAPER 46.

WAR DEPARTMENT, SIGNAL SERVICE, U. S. A.,
UNITED STATES TELEGRAPH,
Maricopa, March 5, 1877. (Received at San Diego, ———.)

To Lieutenant PHILIP READE,
Assistant Signal-Officer, in Charge:

I am just in receipt of reliable information that an attack may be expected upon this station at any moment by 200 young Pima warriors.

Mr. Henry Morgan, a man who has lived among them for last fifteen years, was informed of this movement, secretly, last night after dark, by a Pima squaw.

This is caused by the report that two Indian prisoners taken hence to Phœnix and imprisoned were hanged by a mob instead of having escaped, as generally reported. It is believed by all whites that they were hanged. If this is the case, sudden and serious trouble must occur, and the attack will be made at night.

For the better protection of life and property the following steps are necessary: That Private Donahoe be directed to get his gun and 75 rounds of ammunition from McDowell, and be furnished with revolver and 75 rounds ammunition; that Private Robinson be directed to get his gun and same ammunition from McDowell—he has revolver here; that I be permitted to give memorandum-receipt for one cavalry-carbine and one cavalry-pistol, cartridges, belt, and holster, and be allowed to buy 75 rounds, each, pistol and carbine cartridges, paying for same personally. These should be brought by special messenger, without delay, from McDowell. Morgan thinks they will cut wires before attacking. It would be well to advise operators at Florence and Phœnix that if wires were down beyond a given time re-enforcements might be dispatched to relieve this station.

A former request for troops was not indorsed by me, as I considered it premature and apprehended no danger until since hanging of the prisoners.

Every precaution will be taken to prevent a surprise. Fifteen males at station, including five soldiers and a sergeant.

I have tendered my services and those of my two assistants for guard duty.

Respectfully,

H. A. DUSOUCHET,
Operator in Charge.

WAR DEPARTMENT, SIGNAL SERVICE, U. S. A.,
UNITED STATES TELEGRAPH,
March 5, 1877.

To ASSISTANT ADJUTANT-GENERAL, DEPARTMENT ARIZONA,
Prescott:

Following copy of telegram, just received from telegraph-operator Signal Service, U. S. A., stationed at Maricopa Wells, Ariz., is respectfully furnished for information of the brevet major-general commanding. * * * * * *

It is impossible for me to determine how much importance should be attached thereto. It may be the apprehensive statement of an alarmist, but, if consistent with public interests, I recommend that a detail be sent from Camp McDowell; and, if deemed either necessary or advisable, will go myself by next stage to Maricopa or beyond.

I would be obliged if favored with an early expression of the views of the department commander.

PHILIP READE,
Lieutenant, Acting Signal-Officer.

WAR DEPARTMENT, SIGNAL SERVICE, U. S. A.,
UNITED STATES TELEGRAPH,
Prescott, Ariz., March 5, 1877. (Received at San Diego ———, 1877, 8.10 p. m.)

To Lieut. PHILIP READE, *San Diego:*

I will attend to the dispatch just received by sending a detachment of cavalry to Maricopa Wells from McDowell.

AUGUST V. KAUTZ,
Commanding.

WAR DEPARTMENT, SIGNAL SERVICE, U. S. A.,
UNITED STATES TELEGRAPH,
Prescott, March 5, 1877. (Received at San Diego ——, 1877, 8.20 p. m.)

To COMMANDING OFFICER, *Camp McDowell, Ariz.:*

A dispatch has been received here that the station at Maricopa Wells is threatened by Pima Indians in consequence of a rumor that the two Indian prisoners taken at Phœnix by Lieutenant Kendall had been taken out of jail and hanged instead of having escaped, as reported.

Send an officer and fifteen men to investigate the matter and report.

AUGUST V. KAUTZ,
Commanding Department.

WAR DEPARTMENT, SIGNAL SERVICE, U. S. A.,
UNITED STATES TELEGRAPH,
Maricopa, March 6, 1877. (Received at San Diego ——, 1877, 7.10 p. m.)

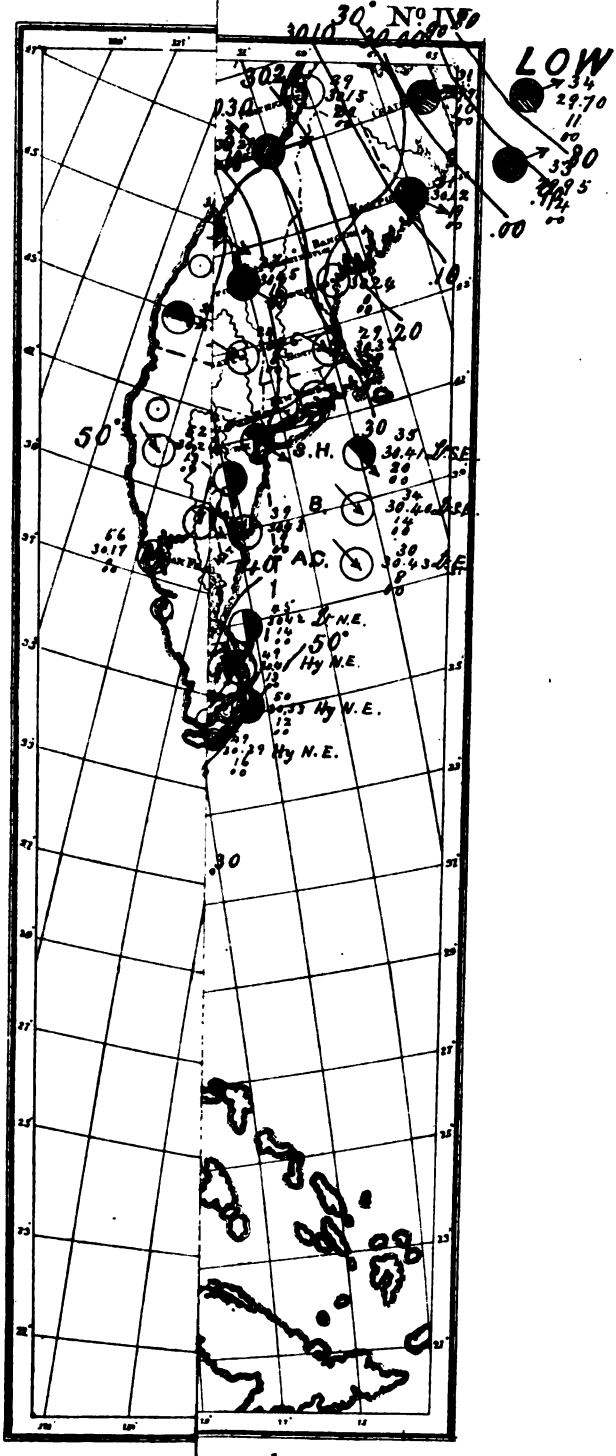
To ASSISTANT ADJUTANT-GENERAL,
Department of Arizona, Prescott:

Arrived here at 4 o'clock this p. m. From what I have been able to gather the Pimas believe that the two Indians taken to Phœnix on the 19th ultimo have been hanged; and on that account are much excited and incensed against those whom they believe caused the troops to come here to make the arrests. Both Mr. Moore and the telegraph-operator are very uneasy about the matter; cannot yet tell how much cause there is for this feeling.

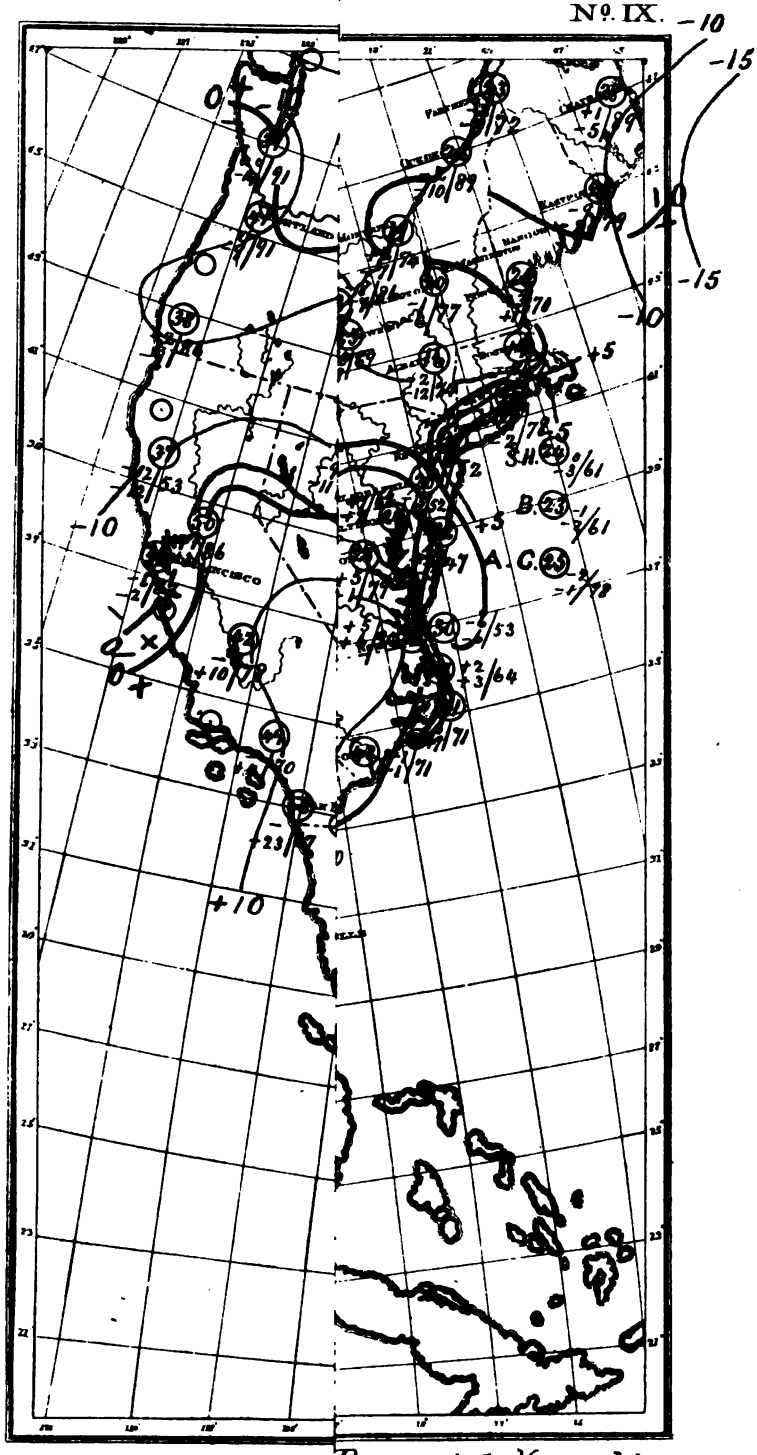
Mr. Moore's party, at work on well twenty-five miles west of here, were fired upon and driven away day before yesterday.

I will report again to-morrow.

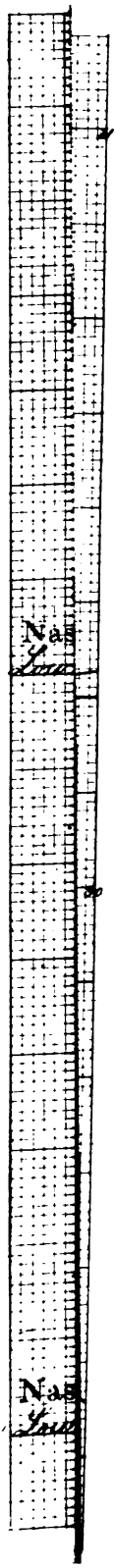
H. M. KENDALL,
First Lieutenant Sixth Cavalry, Commanding Detachment.



rometer



Dew-point Variation.


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